THE CHEMICAL AGE

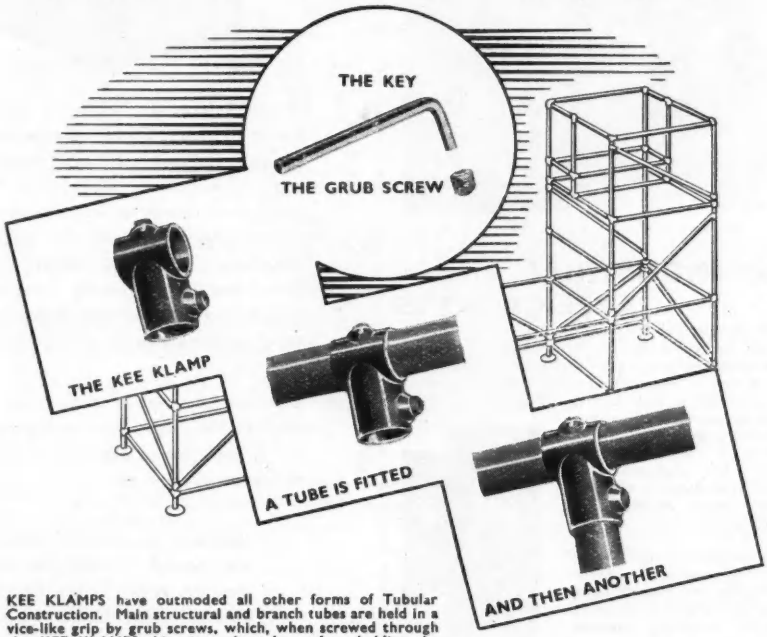
VOL LVI 14 JUNE 1947 No 1457

INDEX TO ADVERTISERS
IN THIS ISSUE

RAPID ERECTION WITH KEE KLAMPS

BEFORE YOU CAN SAY

J·A·C·K R·O·B·I·N·S·O·N



KEE KLAMPS have outmoded all other forms of Tubular Construction. Main structural and branch tubes are held in a vice-like grip by grub screws, which, when screwed through the KEE KLAMPS, bite into the tube surface, holding the structure rigid. *The vertical load carried by one grub screw approaches two tons.* KEE KLAMPS make full use of the tube as structural material. They simplify erection on site by unskilled labour. Structures can be rapidly erected, extended or modified, and can be quickly dismantled.

KEE KLAMPS will joint all forms of Tubular Construction from Hand Rails to Hangars, from Racks to Repair Platforms, from Sheds to Staging, from Tables to Towers and, Sir, that very structure you had in mind. We invite you to send us your constructional problems.

GASCOIGNES

Makers and Patentees of the exclusive

KEE KLAMPS

The GEO. H. GASCOIGNE CO. LTD. (Dept. 3b), BERKELEY AVE., READING. *'Phone 4831-2-3*

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

BOUVERIE HOUSE, 154 FLEET STREET, LONDON, E.C.4

Telegrams: ALLANGAS FLEET LONDON Telephone CENTRAL 3212 (12 lines)

SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970)

MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5)

THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers Limited

VOL. LVI No. 1457. 14 June 1947 Annual Subscription 26s. 8d. per copy; post free, 10d.

Looking Ahead

THAT there is a world shortage of many chemicals most people will agree. This scarcity and the consequent scrambling for what supplies there are make for a highly artificial sellers' market. Firms in their endeavours to obtain supplies will book orders with three or four manufacturers, who will thus all show big future orders which on critical examination may prove to be paper orders only—the first firm to supply will get the order, the others will then have order cancellations. A small percentage increase in production or a fall in demand would be sufficient to change the present sellers' market, stimulated as it is by such artificial means as these duplicated orders, to a buyers' market. When this state of affairs comes along, how many firms will be able to boast that they have kept the goodwill of all their customers; how many will be able to say, "We have answered every inquiry: even though we cannot supply immediately we have explained the position to our would-be customers patiently and politely: we have assured them their order will be fulfilled at the earliest opportunity?" It is understandable that firms whose books are full up for months and years ahead are reluctant to enter into fresh commitments. We would suggest though that if so many letters of inquiry are being received as to cause a hold-up in the office, then a printed circular, explaining briefly the present supply difficulties and remarking that the inquiry will receive attention as soon as possible, should be prepared and sent out immediately an inquiry is received.

It must be admitted, however, that many of these overseas inquiries would not be sent to home manufacturers if our commercial attachés and agents abroad had access to catalogues and trade lists. Our trade representatives abroad, according to the Board of Trade, are continually being asked for technical information about British goods, but owing to scarcity of catalogues and other sources of information they are unable to satisfy the inquirers. With this in mind tht Board of Trade has asked manufacturers to supply more information to its overseas representatives and British commercial attachés. But, so far as we know, the Board of Trade has not given extra paper for the printing of these necessary catalogues, and other technical literature. It seems that if manufacturers can send more literature abroad, with or without extra paper from the Board of Trade, it will go a long way to satisfy the demand for knowledge about British goods, but not perhaps the demand for scarce goods.

A step in the right direction, announced last week was the decision in principle of the British Export Trade Research Organisation to launch in the U.S.A. a monthly publication to consist entirely off standard-sized advertisements based on information supplied by British manufacturers—"A British Shopwindow" to be mailed to 10,000 potential buyers. This, however, is clearly only a partial and regional solution to the general problem of making known what we have to sell to the world at large.

Although most complaints about unanswered correspondence appear to come from abroad, it may well be that home inquiries, e.g., over the telephone, are not receiving the attention they deserve. An

On Other Pages

American chemical journal made hundreds of inquiries of chemical manufacturers and came to the conclusion that though many American firms keep well-organised and efficient sales and advertising departments, they also harbour inefficient or poorly staffed inquiry and order departments. We too, handle many inquiries, both by letter and telephone, regarding chemical supplies and equipment, most of which have to be passed on to manufacturers. Our own experience has been that there is a moderate percentage of firms whose staffs are not *au fait* with the business and who would rather say " no " to an inquiry than go to the bother of looking up details in a catalogue. For instance, on inquiry at a particular firm if they made such and such a chemical, we have been told " I don't know." And that was as far as we could get.

This attitude exasperates people. On the other hand prompt and courteous attention to inquiries, even though it be a regretful negative, would build up goodwill against the time when the present sellers' market may be remembered only as a pleasant dream.

NOTES AND COMMENTS

Journalistic Jubilee

THE CHEMICAL AGE welcomes the opportunity of extending its congratulations to the *Chemical Trade Journal* on its recent completion of a period of service to the chemical industries which began in the year in which the nation was celebrating Queen Victoria's Jubilee. Recording the attainment of its own Diamond Jubilee, the *C.T.J.* reflects that, " but for the scandalous compulsory stoppage of periodicals at the end of February . . . later admitted to have been largely a bluff with which patriotic and law-abiding publishers were only too easily trapped," it could now look back on 60 years of uninterrupted publication. What three major wars and many lesser calamities had failed to do national mismanagement achieved. . . . In wishing the *C.T.J.* an equal term of years of useful activity in the future, we trust that it will never again have to break the journalistic tradition through circumstances it cannot foresee or control.

Graduates in Clover

"SET fair " seems to sum up the prospects of the science graduate who has surmounted the National Service obstacle and whose university training has been sufficiently closely integrated with industrial needs. Industry, according to recent authoritative estimates, is likely to be severely under-supplied for some years at least, and young active scientists with an industrial bent are to find a firm and rising market for their talents. Concrete evidence in support of this came last week

from Dr. W. R. Maddocks, of the Faculty of Metallurgy, Sheffield University, criticising the prevailing call-up system, which he claimed would divert from industry nine out of 12 of the honours students who would graduate this year. The services of the remaining three, he said, would be sought at fantastic salaries. Amplifying his remarks later, he mentioned that three such graduates had each the choice of about ten posts with salaries (before they were 21) of up to £500 a year. Another aspect of the same problem was touched on by Professor S. G. Ward, of the Department of Chemical Engineering, Birmingham University, telling members of the Institution of Gas Engineers that there were to-day fewer than 200 students taking courses of chemical engineering at British universities, compared with 3000 in American universities. And of this inadequate body of potential industrial executives eight or ten were destined to serve the oil companies overseas. Testimonies such as these and the recent admission in Government circles that university and technical training will have to be geared up tremendously if the demand for scientifically trained staffs is to be met discourage any facile optimism that the campaign for scientifically controlled production is likely soon to achieve its target. But for the young science graduate with the right credentials and no National Service debt to pay the prospects could not be fairer.

Scientific Babel

THE view that scientific progress could be accelerated by at least 25 per cent, did all scientific workers speak the same language, has often been advanced and the demand for translations of treatises suggests that it is true. The stumbling block is, of course, common to plenty of other activities not bounded by national frontiers, of which the one most obviously concerned —the aviation industry—is endeavouring to mitigate the difficulties imposed by the disparity in terms of measurement in use by different countries. Since there is no immediate prospect of world-wide adoption of Basic English—or basic anything else—the International Civil Aviation Organisation feels very strongly that the general adoption by all concerned with airways of a common income of describing the fundamentals—time, distance, weight or petrol loads—is the obvious step in the right direction. So it has decided to recommend to flying organisations throughout the world the use of the metric system, the 24-hour clock and the centigrade thermometer. Mollifying our own deep rooted if illogical reluctance to part with symbols hallowed by old associations, the I.C.A.O. recommends most appropriately that the knot and the nautical mile should be retained internationally. Few can deny that the case for similar simplification in the interests of science is long overdue. Force of circumstances has already compelled the use of metric principles in most chemical weights, and of the centigrade system for most purposes. But there remain plenty of anomalies, such as the lb. or kilo, the long or short ton, and so on, the continuance of which is inexplicable.

Precious Metals

THE suspicion which we have long entertained that tin, copper, lead and some other metals have by economic alchemy been translated to the precious metals group is at last confirmed. Tin has now been tacitly recognised as a precious metal by a raid at Liverpool Docks on lines familiar to jewel thieves, by which ten tons of ingots worth £4400 was spirited away. The stage now seems to be set for a come-back of the ancient practice of coin clipping for the infinitesimally small amounts of copper contained in a bus fare; and soon it may be necessary to post a guard on the domestic plumbing equipment. At the present rate recently fixed by the Ministry of Supply of £480 per ton, tin can scarcely be loosely grouped any longer among the non-ferrous metals, and those others who have now to purchase their requirements of electrolytic copper at around £137 (£62 in January, 1946), lead at £90 (instead of £39) may be excused the feeling that current quotations are more suited to the bullion market. No mystery, it seems, is concealed in this typically modern piece of alchemy. World prices, aggravated by world shortages, have long been aspiring to altitudes having little relation to economic realities, altitudes even more rarified than those in which the English market has formerly reached under the artificially controlled conditions which Government buying and selling produces. Non-ferrous metals have in fact, until recently, been cheaper in this country than in many other parts of the world. It has for some time been evident that this relative stability was arti-

ficially contrived and the "subsidies" have now, of course, been withdrawn. The truer picture of trading conditions now presented is not reassuring, especially as there is no certainty that prices have reached their apex. And since Britain seems fated at present to seek most of her semi-manufactures in crowded buyers' markets consumers would face the future with more confidence if their interests in the foreign metal markets were guarded by the skill and enterprise of experienced trade buyers.

Dear Sir . . .

THERE is something distinctly paradoxical in the allegation, which our own observation predisposes us to believe, that many scientists with respectable academic and other attainments cannot make a workmanlike application for a job. The criticism is made by a correspondent in a letter to the *Pharmaceutical Journal*, suggesting that many of the people accustomed to recording tautly and comprehensively a chemical process and the material involved throw all their training to the winds when giving an exposition of themselves to a potential employer. It is a fact, he says, that few choose suitable paper, fewer still write really legibly and even such elementary features of letter writing as a blank left-hand margin and a date at the top are sometimes omitted. Since first impressions are in this instance likely to be decisive, he lists as some of the desirable qualities which so many of such letters lack that the letter of application itself should be restricted to the "desires to make application for . . . and herewith appends particulars, etc.," formula and pleads that those particulars should be neatly typed or written on a separate sheet to match the application letter, starting with name, age, married or single, and working through education, qualifications and experience in an itemised and logical sequence to testimonials and salary. All of which is, of course, so self evident that it would not need to be said—but for the certainty that many a good chemist has been cramped within the confines of a dead-end job largely because he never stopped to apply those very elementary principles.

SCIENTIST SHORTAGE

BIG SALARIES FOR INEXPERIENCED MEN

THE paucity of science students required to supply the greatly increased needs of industry was underlined at conferences last week by speakers representing two universities. Dr. W. R. Maddocks (Faculty of Metallurgy, Sheffield University) told a regional conference organised by the Federation of British Industries in Sheffield that industrialists had said they required five times as many metallurgists in the period 1946-51 as Sheffield University had produced in any similar period before. Yet nine out of 12 of the honours students who would graduate this year were to be called up for the Forces, and this figure, owing to the method of selection, would probably include a graduate with a first class honours degree. The services of the remaining three men were being sought at fantastic salaries.

The students not being called up this year had, before they were 21, offers of posts at salaries of £400, £450 and £500 a year, which was not commensurate with their experience and qualifications and was unfair to the men who were called up.

Lack of encouragement in the gas industry to the young scientifically trained recruit was also cited as an influence discouraging recruitment from the universities, by Professor Stacey G. Ward (Department of Chemical Engineering, Birmingham University) addressing the Institution of Gas Engineers at Birmingham.

To-day, he said, there were fewer than 200 students taking courses in chemical engineering at British universities, compared with about 3000 in American universities. "The young graduate in chemical engineering has not been spoon fed at the university and certainly must not be spoon fed in industry; he does not jib at hard work or at dirty work; but he does jib at not having enough to do, and at apparent lack of interest of superiors."

WIDER USE OF NATURAL GAS

Rich Source of Fuel and Chemicals

THE economics of future large-scale production of petroleum and organic chemicals from natural gas and possibly from other sources of hydrocarbons of the petroleum group indicates that great developments are likely to occur in this branch of chemical engineering, encouraged by the large savings which the process makes possible. This was one of the important aspects underlined by Mr. Robert Price Russell, president of the Standard Oil Development Company, U.S.A., in the course of a lecture, the first of a series he is to give in this country, at the Heriot-Watt College, Edinburgh, last week.

Growing Use of Petroleum

Dr. Russell pointed out that the percentage of the world total energy supplied by petroleum and natural gas arose from about 5 per cent in 1913 to 23 per cent in 1938, and was probably about 30 per cent to-day. This increase, coupled with the rising cost of finding and producing petroleum, was stimulating the search for alternative fuel, using as raw materials natural gas, coal, shale, and bituminous sands. Similar forces were encouraging the development of improved petrols which, when used in suitably designed engines, could effect substantial economies in petroleum consumption. Techniques developed for the production of these improved petrols by catalytic cracking were also being found valuable for synthesising petrol from natural gas and coal.

To meet the two-fold demand for a greater yield of better quality petrol, the oil industry had turned to processes for the catalytic cracking of gas-oils; of these, the fluid catalytic process was responsible for 58.5 per cent of all catalytic cracking capacity in the world outside Russia.

It was estimated, said Dr. Russell, that a hydrocarbon synthesis plant to make about 380,000 tons of petrol and 40,000 tons of gas-oil per year from natural gas would cost about £7,600,000. The plant would also produce about 39,000 tons per year of organic chemicals, principally alcohols. If these chemicals were valued at the same rate as petrol, and natural gas was charged at 3d. per thousand cubic feet, then petrol could be made at 3.9d. per gallon. Petrol of the same high quality made from crude petroleum at to-day's crude prices in the United States costs about 6d. per gallon.

If coal were used as a raw material instead of natural gas, then the capital cost of the plant was approximately double. With coal at 10s. per ton, and assuming that the high quality gas made at the same time could be sold for town's purposes, then the cost of petrol synthesised from coal was about 6½d. per gallon, to which must be added the return on the substantial investment.

More Basic Chemicals

The organic chemicals made as a by-product of hydrocarbon synthesis consisted largely of the lower alcohols, fatty acids, acetaldehyde and acetone, and the mixture promised to make available to chemical industry a number of important raw materials not heretofore available from petroleum sources.

"It is clear," said Dr. Russell, "that the oil industry is not static, and that new sources of petroleum-type hydrocarbons may be tapped in the foreseeable future. To meet future demands on petroleum, technology will require the expenditure of great engineering and construction energy, and will involve enormous tonnages of steel and other construction materials, together with the capital funds involved in building huge new plants in refineries all over the world. The overall political and economic climates doubtless will have a great deal of influence as to how rapidly and how soundly these various changes come about."

Industrial Development

Statutory Powers in Prospect

PUBLISHED this week is the full text of the Industrial Organisation Bill (H.M.S.O., 4d.), which has now received its second reading in the House of Commons and, when enacted, will confer authority upon the Board of Trade, the Ministers of Fuel, Supply, Agriculture, Food and Works, the Admiralty and the Secretary of State to form development councils for industries. Among the wide powers with which it is proposed such councils shall be invested are those of ordering the provision of "such returns and other information, including information with respect to the productive capacity, capital assets, staff, output, sales deliveries, stocks and costs . . . as appear to the council to be required for the exercise of any of their functions." Some safeguards are provided intended to prevent the revelation of trading matters to competitive undertakings or to initiate legal proceedings.

Other matters intended to come within the scope of the councils are scientific research, promotion of export trade and improvement of design and they will be empowered to designate what activities come within any industry concerned.

Government Power Plan

Priorities for Mining Plant

WARTIME measures are to be revived in a Government sponsored production programme designed to relieve the drain on coal supplies and ensure greater production of electric power. This is the substance of an announcement last week by the Ministry of Supply for intensified production of mining machinery, heavy electrical plant and oil burning equipment, of which the conversion of some 1200 locomotives is a part.

Three directorates are being formed under Mr. V. A. G. Lambert, director-general of armament production, "to ensure as far as possible that manufacturers obtain all the necessary materials and components, help the manufacturers over difficulties with materials, labour, and the location of any necessary component capacity, and to 'progress' orders so that deliveries are made as soon as possible."

The Government has given instructions that the highest priority should be given to the provision of raw materials and skilled labour for the production of heavy electrical plant. The production of small generators for individual factory use is also to be greatly accelerated.

Oil and Meal from Herrings

The Minister of Food, in conjunction with the Minister of Agriculture and Fisheries, the Secretary of State for Scotland and the Herring Industry Board, announces that arrangements have now been made for processing surplus herrings into oil and meal during the main fishing seasons in 1947. In view of the extreme shortage of oils and fats the Government have decided to offer to buy from the fishermen the whole of their catch surplus at a price of 30s. per cran. The scheme will operate during the herring fishing seasons off the Shetland Islands, the Moray Firth, the North-East Coast of England and the East Anglian coast. Arrangements for reduction will, where practicable, be made at other herring ports; a number of existing reduction factories will be used. During the ration period beginning June 22, a special sample of margarine containing a certain percentage of refined hardened herring oil will be distributed in the main herring ports of the above-mentioned areas.

Coal Figures Fall

"Strikes and Holidays"

"ALL we can say is that in two weeks of full production the mines have produced practically as much coal in a five-day week as they had previously done in six days," says the Ministry of Fuel announcement, explaining why a full assessment of the results of the five-day week in the coal industry cannot be provided at the beginning of this month, as intended.

"Owing to the first five-day week being affected by the colliery enginemen's dispute in Durham and by holidays in Scotland and last week by Whitsun holidays in England, as a result of which production was seriously reduced, it is not practicable to give such an assessment," the Ministry states.

The final figure for production of deep-mined coal in the week ended May 24 shows a reduction of 45,000 tons from the provisional figure, at 3,802,300 tons; output from the same source the following week (May 31) was 2,860,200 tons (with opencast output 3,019,800 tons). This compares with a total of 2,851,600 tons in the Whitsun week in 1946.

Increase for Shale Workers

Scottish Oils, Ltd., and the National Union of Shale Miners and Oil Workers have agreed to terms which are "at least as attractive as those in the coal industry." The new agreement comes into force on May 26 and includes an 11-day fortnight of an alternating 5-day and 6-day week for all underground workers and those handling shale on the surface. A bonus of one shift is to be paid to all workers working a maximum shift week who are injured. The effect of this concession which came from the employers and which was accepted unanimously by the Union without reference to members, is that most underground workers will receive an increase in the region of 25s. per week. In addition, all tonnage rates and contract work are being increased by 10 per cent. This may mean a wage increase of 14s. per week, although additional charges for explosives may counteract this to some extent.

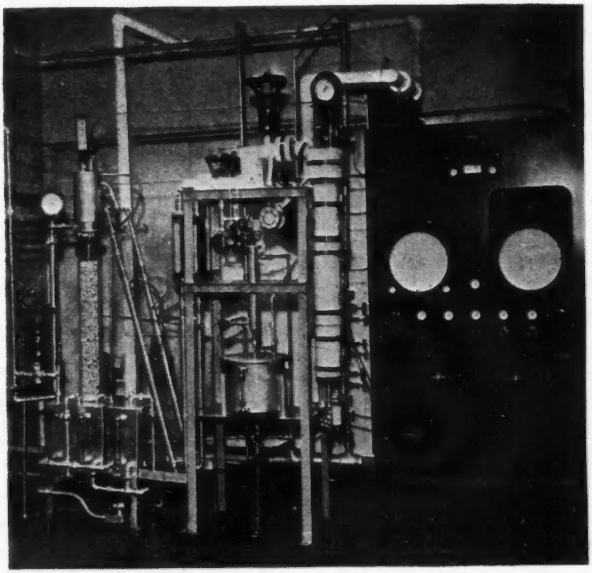
Unrest in Metal Trades

Conflict between workers and managements in the metal industries was confidently forecast by officials of the National Society of Metal Mechanics at its annual conference at Exeter last week-end. Opposing the granting of increased benefits to members, the vice-president of the society (Mr. T. Granger) said: "In the near future there is going to be a fight between the employees and the employers. We in the Midlands can see it coming. I hope you will not throw away the money that we are going to need for that fight."

AUTOMATIC SOLVENT RECOVERY PLANT USING ACTIVATED CARBON

A new research group to study industrial applications of vapour-adsorbent activated carbon has been established at Mellon Institute, Pittsburgh. The group will co-operate with users of vapour-adsorbent carbons to improve eqipment and processes for the recovery of solvent vapours, to study methods for the purification of industrial gases and deodorisation of air, and to study industrial processes for the separation of materials in the vapour phase.

To aid these studies a new experimental pilot plant for solvent recovery with activated carbon has been installed. Automatically controlled, this new pilot plant replaces a manually-operated unit, and can duplicate accurately the conditions in industrial solvent recovery plants using activated carbon. Engineering data thus obtained make possible design improvements for new plants and operating economies for existing plants.



A view of the pilot plant used for solvent recovery with activated carbon.

New I.C.I. Factories

Plans to erect research laboratories drawn up by Imperial Chemical (Pharmaceutical), Ltd., and British Schering Industry have been submitted to Wilmslow Urban District Council. After the council had raised objections to I.C.I. plans for the erection of administrative buildings and laboratories in the Morley district, attention was turned to alternative sites and a similar development is now suggested in the Hough district. Discussions have also taken place between the council and British Schering regarding development at Handforth.

Subject to Ministry of Health approval, the Liverpool City Council, on June 4, agreed to the sale, to Imperial Chemical Industries, Ltd., of 50 acres of land at Kirkby, with a 900-yard frontage to the East Lancashire road, at a cost of £75,000, together with an option of ten years on another 50 acres at the rear of the first portion. Imperial Chemical Industries intends to erect a factory producing copper tubes and similar goods, principally for export. The erection of the new factory must start within five years.

A Factory Heat Balance

Where to Look for Savings

IN the *Fuel Efficiency News* for June details are given of the theoretical and actual heat consumption in a factory producing hardened whale oil. The heat balance described is confined to the boiler house and the utilisation of the steam. The following account of the successive steps will no doubt interest those who wish to apply the method in their own works.

1. A base temperature was selected, this being 12°C. (53.6°F.), the average temperature at which most of the raw materials were received.

2. The coal required to make available 1000 B.Th.U. in the form of steam for use in the factory was estimated as 0.1284 lb., this representing the overall consumption at the boilers.

3. A material balance was constructed for each heat-using process, together with data on specific heats, process methods, etc.

4. A calculation was then made of the theoretical quantity of heat required to produce 1 ton of each type of product. There were eight products in all at this factory and a typical summary of process heat for one of them was:

Product: Hardened whale oil

		B.Th.U. per ton of product
Refining	Preheating	160,119
	Recoverable condensate	19,214
	Hot water	123,137
Bleaching	Preheating and drying	22,586
	Recoverable condensate	2,710
Soap splitting	Preheating	15,604
	Non-recoverable condensate	1,873
By-product recovery		5,100
Hydrogenation	Preheating	Nil
	Hydrogen production	239,986*
	Catalyst preheating	666
Total heat required		590,995
Less recoverable condensate		21,087
		569,908
Less recoverable heat of reaction		202,607
Net heat required		367,301

* This consumption is in the form of steam which is used to produce the distilled water required to make good the removal of water in the form of hydrogen and oxygen from the electrolytic battery.

In the foregoing "Recoverable Heat of Reaction" refers to the heat liberated during the exothermic hydrogenation reaction, and it is recovered by circulating softened water under pressure through coils in the hydrogenating vessels. The superheated water so obtained is then partially flashed off into steam and the mixture of pressure water and steam is then cooled in coils situated inside storage tanks filled with crude oil.

5. The coal required to produce a given output (say 500 tons) was then calculated from (2) and (4), with an allowance for unavoidable radiation losses:

	Tons of coal/week
Theoretical fuel required	=10.5
Process radiation losses	= 3.5
Total fuel required to produce 500 tons of hardened whale oil	14.0

6. Similar estimates and measurements were made for space heating and losses from storage tanks, etc., termed "non-productive consumption."

7. The theoretical requirements so determined were compared with the actual coal consumption as follows:

	Percentage coal burnt
Theoretical process requirements	25.3
Process radiation losses	8.4
Non-productive consumption	37.8
Preheating factory on starting up after week-end stoppage	5.2
Unaccounted	23.3
Total burnt	100.0

The "unaccounted" heat is not considered as abnormally high; it is made up of inevitable errors and heat losses in directions not taken into consideration. It is interesting to notice that only 25.3 per cent. of the coal burnt is "useful" heat for process work. An analysis of this kind showing where the heat goes is of untold value in showing where to look for savings.

Dublin Colloquium

Industrial Uses of Agricultural Products

UNDER the joint auspices of the Irish Chemical Association and the Dublin Section of the Royal Institute of Chemistry, a colloquium will be held in Dublin on July 2-3. Its title is "The Industrial Utilisation of Agricultural Products and of Seaweed."

There will be 21 speakers and their subjects include: "Agricultural Products and the Chemical Industry," by Dr. J. L. Simonsen; "The Production, Properties, and Uses of Seaweed Rayon," by Professor J. B. Speakman, and "The Utilisation of Carbohydrate Products," by Dr. E. L. Hirst. Joint chairmen of the colloquium, which is to be held in the department of chemistry, Science Buildings, Upper Merrion Street, Dublin, will be Dr. V. C. Barry and Dr. A. G. Leonard.

LARGE-SCALE PRODUCTION OF OXYGEN

Industrial Possibilities

by DAVID D. HOWAT, B.Sc., Ph.D., F.R.I.C., A.M.I.Chem.E.

VERY significant developments involving the large-scale utilisation of oxygen are now under way in the U.S.A. Carthage Hydrocol Inc. of Texas recently announced the building of a new plant for the partial oxidation of natural gas to produce petrol, diesel oil and crude alcohols. This large new undertaking includes a plant with a capacity of 48,000,000 cu. ft. per day of 95 per cent oxygen. The company have expressed the confident belief that oxygen will be made available at the extraordinarily low figure of 4.8 cents (say 3d.) per 1000 cu. ft. At least one other similar plant has been ordered while many processes involving the utilisation of 95 per cent oxygen are projected. Leading American industrialists are planning new developments in which the utilisation of oxygen figures prominently in the firm conviction that the price of 95 per cent oxygen will be about 12 cents (say 7½d.) per 1000 cu. ft.

These facts must occasion serious thought in this country. In view of our crucial fuel position any method permitting more efficient utilisation of our limited resources should receive careful consideration. Further, the numerous advantages following the adoption of oxygen in place of air are well-known and very important in reducing production costs. Hitherto, large-scale utilisation of oxygen has been confined to Germany, France, Belgium, and Russia, while in this country and in the U.S.A. oxygen has been employed in the past in limited quantities for highly specialised purposes only.

Reducing Costs

Current reports from the U.S.A. are sufficient reason for an immediate and careful survey of all the relevant facts and for the development in this country of processes designed to yield large quantities of oxygen of 80 to 95 per cent purity. Every effort must be made to cut manufacturing costs to the minimum. Even if it is not possible to rival the anticipated American figure of 7½d. per 1000 cu. ft. the main argument of this article is that it should be possible to provide oxygen at 1s. to 1s. 6d. per 1000 cu. ft. Only under these conditions will far-reaching and valuable developments become practicable.

Relatively pure oxygen has been available for very many years, Carl von Linde having first accomplished low-temperature fractionation of liquid air on a scale with commercial possibilities in 1895. Shortly after this time the Claude and Heylandt processes for liquid air separation were developed on an industrial basis. The development of the oxygen-acetylene welding and cutting processes represented the most marked industrial advances following upon the newly discovered methods for oxygen production. The total oxygen made available by these processes was severely limited, while the manufacturing costs were so high that the utilisation of this gas as a replacement for atmospheric air for industrial purposes could not be seriously contemplated.

Frankl Heat Exchanger

While improvements in operating technique continued in association with advances in design and expansion in the size of the manufacturing units, no substantial change or radical modification in the plants was recorded for over 30 years. Two significant advances were made almost simultaneously about the year 1930. First was the adoption by the Linde Company in Germany of the Frankl heat exchanger which in many respects has very important operating advantages over the conventional type of tubular heat exchanger previously employed. Chief among these advantages is the elimination of the necessity to purify the greater part of the air entering the system. This, in conjunction with improvements in the thermodynamic cycle of operations has greatly reduced the energy consumed in air separation.

Second, the invention and development of the expansion turbine has played a great part in large-scale oxygen production. When employed in the expansion circuit the turbine yields conditions more closely approximating to true adiabatic expansion and therefore gives greater refrigeration performance than the other types of expansion engine. Further, as no oil is employed in the turbine the difficulties of lubrication at low temperatures are eliminated with a great simplification of plant operation.

Some recent publications have yielded extremely useful data on the developments and possibilities of large-scale oxygen production. These publications include Ruhemann's valuable book[1], together with some papers by the same author[2], Kapitza's own earlier reports of work on the high-speed

expansion turbine[3], supplemented by a very recent account by Professor Irving Langmuir of his visits to Kapitza's laboratories in Moscow[4], and finally some extremely valuable B.I.O.S. and C.I.O.S. reports on oxygen production in Germany, France and Belgium.[5]

Earliest firm in the field of gas separation by liquefaction was Gesellschaft für Lindes' Eismaschinen at Hollriegelskreuth, founded in 1879. Production of pure oxygen by the fractional liquefaction of air was started on a commercial scale by this firm in 1895. Carl von Linde was apparently the first to realise that the well-known fractionating methods of the alcohol and petroleum industries could be applied equally to the separation of the components of air with the consequent possibility of large-scale production of oxygen at reasonable prices. The vast scale and importance of the whole field of industrial gas liquefaction and separation date from Linde's invention of the first continuously operating plant for oxygen production.

Interlinked Processes

Following closely on Linde's invention came the liquefaction processes devised by Claude and Heylandt. Until very recently these three main groups of interests dealing with air liquefaction and oxygen production were so closely interlinked that it was difficult to differentiate between them while certain items of equipment were employed apparently quite interchangeably.

Clark[5] stresses that processes for fractional distillation of liquid air differ from most ordinary processes of fractional distillation in the fact that the mixture to be separated is introduced into the system as a gas, the products of the separation being withdrawn in the same form. With efficient heat exchange all the intake of air reaches liquefaction temperature during its passage through the system but the gaseous products emerge almost at the same initial temperature. The passage of air through the system, therefore, has only a slight warming effect on those parts of the apparatus which are at a low temperature. Actual separation of the constituent gases of the air demands the expenditure of a certain quantity of energy—equivalent to the introduction of heat into the system. Means must therefore be provided for the removal of this heat at liquid air temperatures. In addition there is a certain irreducible absorption of heat into the system from the surroundings.

Under the conditions obtaining in an air-separation plant the only way in which heat may be abstracted from the system is by the performance of work in a suitably organised manner. The actual energy consumed in the separation of the constituents of air depends upon the efficiency with which the work done on the gas is used to obtain the necessary cooling effect. Further, all factors tending to introduce heat into the system will increase the work required to maintain the low temperature, while anything causing work to be performed uselessly within the system, *e.g.*, a high pressure drop through the heat exchangers will exert a similar effect.

To produce a cooling effect, work done on the gas may be applied in two ways: (a) by expanding the compressed gas through a valve or throttling device without the performance of external work, *i.e.*, the Joule-Thomson effect, and (b) by expanding the compressed gas in an engine. Theoretically the latter is the more efficient method as it should be possible to carry it out without any increase in entropy but practical limitations frequently reduce the efficiency to quite a serious extent. To gain improved efficiency in processes utilising the Joule-Thomson effect the gas must be cooled initially to as low a temperature as possible by external refrigeration, an indirect ammonia refrigeration circuit being employed frequently.

A combination of these two methods for the abstraction of heat is employed in all the modern large-scale plants for oxygen production in Europe. In the U.S.S.R. where research on large-scale oxygen production has been based on the development of the high-speed expansion turbine, Kapitza's belief in this machine has led to the adoption of cycles in which the Joule-Thomson effect is not utilised. No evidence is available from Russia as to the new large-scale oxygen plants planned to utilise the high-speed expansion turbine, but an account will be included later of Kapitza's pilot plant cycle.

In the European systems for large-scale oxygen production the three most important items of equipment are the fractionating column, the heat exchangers and the expansion engines.

Fractionating Column Defects

In Linde's original plant, patented in 1902, the separation of oxygen from liquid air was effected in a simple fractionation column from which practically pure oxygen was obtained. The main disadvantage of this piece of apparatus was that while it produced pure oxygen, the nitrogen, usually vented to the atmosphere, contained large quantities of oxygen. Ruhemann[1] proves that 19 per cent of the oxygen passing through the column escaped with the nitrogen and was lost. In the next stage of development a double-column fractionating tower was devised by Linde and patented in 1910. As the tower remains essentially

unchanged in design after 36 years of commercial application it is fairly obvious that the operating principles are sound, any improvements possible involving only minor technical details.

In considering the double column Ruhemann[1] points out that the low temperatures necessary in fractional distillation must be maintained with the help of some refrigerating machinery to permit of the transfer of quantities of heat at certain specified low temperatures. In the separation of air the only refrigerating agents available are air itself, oxygen or nitrogen.

Oxygen Separation

To separate the oxygen more completely the gaseous nitrogen must be condensed at its boiling point and this will be the coldest part of the column. Further, the temperature of the refrigerating agent must be somewhat lower than that of the substance being condensed, *i.e.*, a temperature head must be maintained in the condenser. Linde devised the most convenient method of attacking this problem. This involved raising the temperature of the boiling nitrogen by increasing the pressure in the column. At 5 atmospheres pressure (absolute) the boiling point of nitrogen is −179° C., which is higher than the boiling point of oxygen at atmospheric pressure (−183° C.). Accordingly, the pressure in the lower half of the column is maintained at about 5 atmospheres pressure while that of the upper column is maintained at about 0.2 atmospheres pressure. Under these circumstances the condensation temperature of nitrogen in the lower column is below the boiling point of oxygen in the upper column.

Fractionation Tower

In the operating of the fractionation tower compressed air, precooled in a heat exchanger, enters the evaporator coil, being subsequently expanded to 5 atmospheres pressure through an expansion valve and fed to the lower column. In the lower column the stream is separated into pure liquid nitrogen and a rich liquid containing 40 to 45 per cent of oxygen. This oxygen-rich liquid is withdrawn from the bottom of the lower column, reduced to about 0.2 atmosphere pressure in an expansion valve and admitted to the middle of the upper column.

A tubular condenser-evaporator is interposed between the lower pressure column and the upper atmospheric column, the construction of this unit being indicated in Fig. 1. Liquid nitrogen collects in the trough of this condenser-evaporator, is withdrawn through a valve and readmitted to the top of the upper column. Gaseous oxygen is drawn off through an outlet in the dome of the condenser-evaporator while the final gaseous nitrogen outlet is located right at the top of the upper column.

Table 1, taken from Weir's report[5] on the Linde Company, shows typical quantities, temperatures and pressures involved in the operation of a double-column fractionating tower.

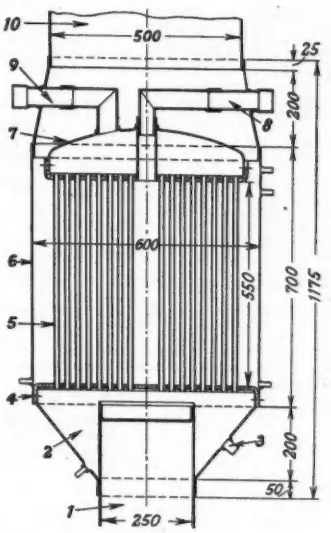


Fig. 1. Condenser-evaporator (dimensions in mm.)

1. **Lower (pressure) column.**
2. **Trough for liquid nitrogen.**
3. **Outlet for liquid nitrogen.**
4. **Plate for tubes.**
5. **Tubes of condenser.**
6. **Casing of condenser-evaporator.**
7. **Dome.**
8. **Outlet tube for gaseous oxygen.**
9. **Connecting tube to safety valve.**
10. **Upper column (low pressure).**

TABLE 1

Typical quantities, temperatures and pressures involved in the operation of a Linde-Frankl plant, with particular reference to the double-column fractionating tower.

Total air processed in the Linde-Frankl plant :
compressed to 4.6 atm. : 11,900 cu.m.
compressed to 180 atm. : 755 cu.m.
Total air processed per hour : 12,655 cu.m.

	Nitrogen Frankl heat exchangers	Oxygen Frankl heat exchangers
Low pressure air cu.m. per hour	9190	2250
Cold nitrogen cu.m. per hour	9530	—
Cold oxygen cu.m. per hour	—	2335

Total product oxygen is given for " cold " oxygen. Sum of oxygen and nitrogen produced is 12,235 cu. m. The shrinkage in the volume of air processed is due to purging and losses.

Typical temperatures as follows. Air feed into unit about 15°C. :
Combined air from both Frankl exchangers : −172°C.
Nitrogen into Frankl exchangers Nos. 1 and 2 : −175°C.
Oxygen into Frankl exchangers Nos. 3 and 4 : −172°C.
Both " pure " streams out of Frankl exchangers at about 13°C.

Typical double-column fractionation tower conditions would involve :

	Lower Column	Upper Column
1. Pressures	4.2 atm. (gauge)	0.2 atm. (gauge)
2. Temperatures (°C.) :		
Top	−182	−194
Bottom	−172	−185
3. Reflux liquid	Not directly given	3900 cu. m. (liq. N_2)
4. Product (expressed as gas) :		
Top	705 cu. m. of nitrogen (liquid)	9530 cu. m. of nitrogen (gas)
Bottom	6900 cu. m. (liquids mixed)	2432 cu. m. (liquid oxygen)
5. Plates	24	36
6. Plate spacing	90 mm.	90 mm.

The Dephlegmator

This apparatus, devised by Claude, may be employed in place of the double-column fractionating tower, proving particularly useful for the manufacture of low-purity (80 to 90 per cent) oxygen. In the standard Linde double-column, the liquid collecting in the lower column contains only about 45 per cent of oxygen. A liquid in equilibrium with atmospheric air will, in fact, contain almost this percentage of oxygen without further rectification. If the bottom half of the lower column is discarded, air may then be introduced as a saturated vapour at the bottom of the column and a liquid containing 40 per cent of oxygen will then collect in the sump. This fact constitutes the basis for the development of the dephlegmator, a specialised type of condenser-evaporator comprising a series of vertical tubes enclosed with a cylindrical container.

According to Ruhemann[1] when the dephlegmator is in operation a current of comparatively warm gas is moving upward with a stream of cold liquid trickling downwards along the walls of the tubes. The liquid will contain more oxygen than the ascending vapour with which it interacts but less oxygen than it would contain if it were in true equilibrium with the vapour. Part of the vapour will condense to form a liquid with a higher oxygen content while part of the liquid will vapourise to form a gas containing less oxygen. In consequence the liquid trickling down the tubes becomes gradually enriched in oxygen while the ascending vapour becomes richer in nitrogen.

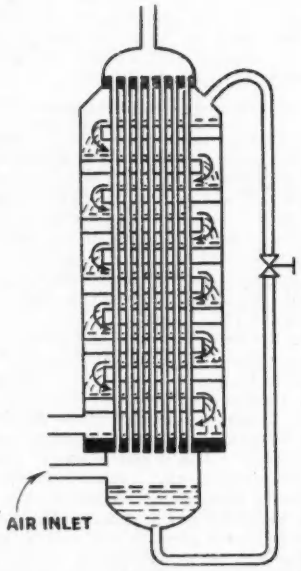


Fig. 2. Dephlegmator (continuous evaporator).

The liquid escaping from the bottom of the condenser cannot contain more oxygen than is in equilibrium with the gaseous mixture entering the tubes, but with a sufficient length of condenser and provided the refrigerating liquid is sufficiently cold the vapour emerging at the top of the condenser may be almost pure nitrogen. Within the tubes a temperature head will be set up corresponding to the difference between the boiling points of nitrogen and of the liquid mixture escaping from the bottom of the condenser.

If the liquid escaping from the bottom of the condenser is expanded through a valve to atmospheric pressure and then delivered between the tubes of the condenser it will provide the refrigerating effect, partly by evaporation during the expansion and the remainder by condensation occurring inside the tubes. Finally, all the liquid forming at the bottom of the condenser will emerge

from the space between the tubes as a saturated vapour. The main objection to this design of dephlegmator was that no appreciable temperature head could be developed outside the tubes between the top and bottom of the vessel.

To overcome this disadvantage, Claude developed a type of dephlegmator in which the space outside the vertical tubes contains a series of horizontal trays, each with an aperture at the side. In operation, the liquid is expanded through the valve and admitted to the topmost tray in the dephlegmator. As the liquid trickles down from one tray to the next it evaporates continuously, the vapour produced remaining in contact with the liquid throughout the extent of the dephlegmator. In consequence the concentration of liquid and vapour varies from tray to tray thus enabling the necessary temperature head to be developed. Construction is indicated in Fig. 2. One extremely important advantage of this new type of dephlegmator is that it enables the pressure to which the whole initial air feed must be raised before admission to the dephlegmator to be reduced from 3.3 atmospheres to 2.3 atmospheres. Under certain circumstances the power economy thus gained is of paramount importance.

Dephlegmators have been incorporated in several plants designed to provide low-purity oxygen, particularly for the iron and steel industry for enriching the combustion air supply to furnaces. A flow-sheet for an oxygen-manufacturing plant incorporating a dephlegmator is shown in Fig. 3.

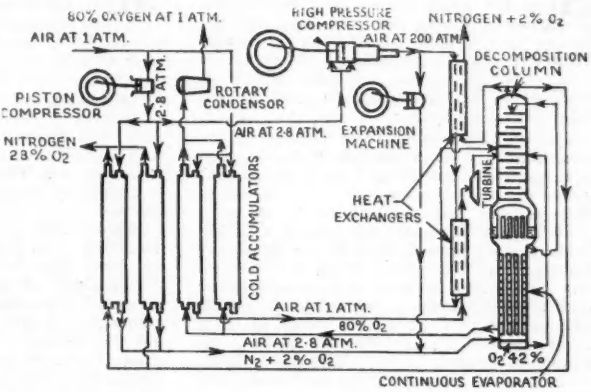


Fig. 3. Flow-sheet for oxygen production as used in iron blast furnaces.

(To be continued)

REFERENCES

[1] Ruhemann, *The Separation of Gases*, Oxford, 1940.
[2] Ruhemann, *Trans. Inst. Chem. Eng.*, Vol. 20, 1942, pp. 55-64.
[3] Kapitza, *J. Physics.*, Acad. Sci. U.S.S.R., Vol. 1, No. 1, 1939, pp. 7-27 and pp. 29-49.
[4] Langmuir, *Chem. and Eng. News*, Vol. 24, No. 6, Mar. 25, 1946, pp. 757-761.
[5] Clark, *Large-Scale Production of Oxygen*, B.I.O.S. Final Report, No. 591.
Weir, *Gesellschaft fur Lindes' Eismaschinen*, C.I.O.S. File No. XXVII, 55.
Robell, *Gesellschaft fur Lindes' Eismaschinen*, F.I.A.T. Final Report No. 840.
[6] Collins, *Ind. and Eng. Chem.*, Vol. 53, No. 12, pp. 106-107, Dec. 1946.
[7] Hochgesand, *Mitt. a.u. Forsch. d. G.H.H.*, Vol. 4, Part I, pp. 14-23, Aug. 1935.
[8] Meyer, *Die Kosten Chemischer Operationen*, 1936.
[9] Karwat, *Stahl u. Eisen*, Vol. 55, Part 32, 1935, pp. 860-863.
[10] Shapovalov, *Kislorod*, 1944, No. 1, pp. 17-31.
[11] Semenenko, *Kislorod*, 1944, No. 3, pp. 11-16.
[12] *Chem. Eng.*, Vol. 54, No. 1, Jan. 1947, pp. 123-131.
[13] Lobo and Skaperdas, *Trans. Amer. Inst. Chem. Eng.*, Vol. 43, Feb. 1947, pp. 69-74.
[14] Trumpler and Dodge, *Trans. Amer. Inst. Chem. Eng.*, Vol. 43, Feb. 1947, pp. 75-84.

Dutch Trade Marks

The Dutch Trade Mark Office has recently reversed its former practice of refusing the registration of a trade mark if it resembles a mark already on the register, even if the proprietor of that earlier trade mark consents. It will now be possible to make applications for the registration of a trade mark "with consent" as is done in this country. Applications of this kind which have been refused in the past, can now be renewed.

Bitumen Fire

A chain of workpeople and villagers was formed to save tons of paint from a store shed, when fire broke out last week at the premises in Wesley Street, Ossett, of Messrs. Pickles, Ayland and Co., manufacturing chemists. A bitumen manufacturing shed, several huts, 6000 gallons of bitumen, 200 gallons of paint remover, and two tons of water paint were destroyed. The damage is estimated at well over £1000.

Registration of Business Names

A MEASURE which has been in operation for many years—The Registration of Business Names Act 1916—and still remains very actively administered, should be noted by all newcomers to business on own account, or in any case where in trading, a business name is used or intended to be used.

The position is that every firm or individual who carries on business under a business name which does not show the actual name of the proprietor(s) or partner(s) must register with the Register of Business Names (for England and Wales address, Bush House, Strand, W.C.2; for Scotland, Edinburgh). The point of the Act is that any addition to the true surname and christian name or initials, makes registration necessary, *e.g.*, if T. Trader trades as, say, T. Trader & Co. or Trader & Co., or Trader & Trader, or any other name other than T. (or Thomas if he is Thomas, of course) Trader.

When registering, various particulars are required to be given: business name, nature of business and principal place of business; present (and former, if any) christian name and surname; nationality; usual residence, and any other occupation of the person concerned if there is one. The date of the commencement of the business must be given and all the particulars above must be furnished within 14 days after date of starting business; if any change occurs the Registrar must be informed within 14 days of the change, although the Board of Trade may allow more than 14 days, if they consider them necessary.

An important obligation is that in all trade catalogues and circulars, showcards, and business letters where the business name appears there must be mentioned where the case concerns an individual, the present christian name or initials and present surname, nationality (if not British). If the case concerns a firm, the foregoing applies in respect of all partners.

Professions as well as trades come under the Act, and corporations are included where one or more individuals and one or more corporations or two or more corporations have entered into partnership with one another to carry on business for profit under a business name. This does not, of course, mean trading by limited companies in the ordinary way under the name, and conditions required under the Companies Act. While failure to comply with the Act is an offence under penalties, any contract entered into by a concern which has failed to comply with the Act are not enforceable by action or other legal proceeding.

Technical Literature

Benn Books

MANY publications of chemical and metallurgical interest figure in the trade and technical book list for 1947 of Ernest Benn, Ltd. Included are "Chemistry and Physics of Clays and Other Ceramic Materials" (A. B. Searle), "Design and Arrangement of Chemical Plant" (G. L. Weyman), "Design and working of Ammonia Stills" (W. Parrish, "Autoclaves and High Pressure Work" (H. Goodwin), "Blacks and Pitches" (H. M. Langton), "Chemistry of the Blood" (O. L. V. de Weseelow), "Chemical Reflections" (Stephen Miall), "Chemistry, Three Centuries of" (J. Irvine Masson), "Chemistry of Hat Manufacture" (Watson Smith), "Chemistry of Drugs," 2nd Edition (N. Evers), "Chemistry Power Plant" (W. E. Gibbs), "Dust Hazard in Industry" (W. E. Gibbs), "Limestone and its Products" (A. B. Searle), "Manufacture of Sulphate of Ammonia and Crude Ammonia" (G. Calbert), "Natural Varnish Resins" (T. H. Barry), "Prob. lem of Solution" (Stephen Miall), "Sulphuric Acid Concentration," Vol. II (P. Parrish), "Sulphuric Acid Reaction Chambers" (P. Parrish), "Transport and Handling of Mineral Acids" (F. Hirsch).

The extension of the formulation of standards on an international basis is one of the subjects of the last issue of *Standards Review*, published periodically by the British Standards Institution. The 25 nations co-operating last year on the United Nations Standards Co-ordinating Committee have formed an International Organisation for Standardisation to co-ordinate existing national standards and issue new ones with the consent of all member countries.

"The production of power by the use of atomic energy will certainly be achieved—perhaps even next year—but it will at first be on an experimental scale only," predicts Sir Wallace Akers in the *I.C.I. Magazine* for May, which provides once again a very lively and liberally illustrated review of affairs, and not exclusively of those with which I.C.I. is chiefly concerned. Providing a well-informed survey of the scientific background of atomic energy, the magazine foresees that "It will be a long time before this new form of energy will begin to take its place alongside coal and oil as an economic source of industrial power."

Obituary

MR. WILLIAM BUCHANAN (Pease & Partners, Ltd., of Pond House, Hurworth, near Darlington, died recently at the age of 58.

Salt in War and Peace

Lesser Known Industrial Uses

AN interesting article on salt in *The South African Mining and Engineering Journal* gives details of some of the lesser known industrial uses of this common commodity. Salt, it says, is not popularly regarded as a war mineral of critical importance. In scores of essential yet little publicised directions, however, this familiar substance made a vital contribution to war production, and some of the uses developed or expanded for military purposes may have a significant bearing on the future of one of the world's oldest and most widespread industries.

Even before salt is divided into its chemical constituents, sodium and chloride, it has an enormous range of useful applications, while each element has a further long list of uses. Chemicals from salt have long been used in many medicines, and recent uses include the groups of sulpha and vitamin drugs. During the war chemicals were made not only from the brine, but also from thousands of tons of " dry " salt.

War Uses

Both elements of salt are used in many war materials. Sodium and chlorine are needed for the production of tetra-ethyl lead for high-octane fuels. Cotton linters for smokeless powder are treated with chlorine for bleaching and sodium for purifying. The cleaning and degreasing of metal tools, parts and shells require both elements, as do many dyestuffs.

The war in the hot jungles of the Far East led to the development of several new applications for salt and its derivatives. Men fighting in the jungles were supplied with salt tablets to combat loss of salt through perspiration, while chlorine proved an effective spray for eliminating mosquitoes and other jungle insects. In the Navy salt is supplied to men not only in tropical waters but also when working below decks in hot engine rooms.

The war led to an enormous expansion in the demand for chlorine, which has numerous wartime applications, two interesting examples being smoke screens and smoke bombs. Chlorine compounds are used in plastics, special water and mildew-proofing waxes, fire extinguishers and disinfectants. Common salt is the only raw material from which chlorine is produced. In 1943, 2,656,293 tons of all classes of salt were consumed in its manufacture in the United States alone. Over 3000 lb. of salt are required to produce one short ton of chlorine. One of the basic ingredients of DDT is chlorine.

In 1943 the United States used over 66,000 short tons of salt, exclusively of chlorine and other salt derivatives, in the manufacture of synthetic rubber and rubber-like materials.

The salt industry is almost as old as mankind itself. At all events, it must date back to the time when primitive communities grew to such an extent that their requirements could no longer be satisfied without some crude organisation of production. Salt is essential to health and vigour. An animal with insufficient salt in its food grows feeble, and if salt is entirely lacking it soon dies. In Holland one of the legal punishments used to be to deprive a man of salt, resulting in depression and illness. At one time criminals in Sweden, as an alternative to capital punishment, were allowed to obstain from salt for a month, with the result that they usually died before the end of the month.

Apart from the household sphere, salt is nowadays required as a food preservative, as a lick for sheep and cattle and in the production of hundreds of essential commodities. It is used as a raw material in the manufacture of soap, paper, cyanide, chlorine, hydrochloric acid, soda ash, and medicines. Hide and skin merchants require it for tanning purposes. Creameries and bakers are large users. Mines and municipalities require enormous quantities for water purification. Other important fields are the manufacture of salt-glazed pipes and the enamel trade; salt is used as a flux in various metallurgical processes and in the production of many heavy and fine chemicals. In fact, there is hardly an industry which for one purpose or another does not need salt.

Sodium Compounds

Sodium compounds derived from salt have many important uses of their own. The largest use for soda ash is in glass-making, and for caustic soda in rayon-fabric manufacture. Sodium compounds assist in the removal of unwanted sulphur compounds from petroleum products, and are essental raw materials for phenolic resins. They are used in the production of rayon cord for rubber tyres, and also to dissolve the cord fabric in tyres when the rubber is to be reclaimed.

Salt is said to be the simplest and cheapest of all glazes, and its use for glazing ceramics has considerably increased. In the United States it is being extensively used on roads, being applied mainly to secondary roads, where the salt is bladed in the clay or gravel of the top layer.

In agriculture, salt has recently been

used with considerable success as a fertiliser for beets and mangolds. It is claimed that the application of from 500 to 1000 lb. of salt per acre, in addition to the regular fertiliser used, may increase the yield from 13 tons to 21 tons per acre. Salt has also been used instead of potash on mangolds, sugar beets and cabbage at the rate of 500 lb. an acre. Moreover, when employed in conjunction with a good dressing of sulphate of ammonia, it is said to act as beneficially as muriate of potash.

Salt Users

Insufficient data are available from many countries to permit any accurate estimate of the present annual world production of salt, but it is probably in the vicinity of 36,000,000 tons. At one time practically all the salt of commerce was derived from the evaporation of sea water, and sea salt is still a staple commodity in many maritime countries. To-day, however, commercial salt is obtained mainly from two sources—natural brine and salt rock.

When brine is evaporated the salts separate in order of their solubility, the order of deposition being calcium carbonate, calcium sulphate, sodium chloride, magnesium sulphate, carnallite potassium (magnesium chloride), and finally magnesium chloride. These salts are not deposited completely within sharply defined limits of concentration, each salt being contaminated to a greater or lesser degree with others. The art of the saltmaker is to produce grades suitable for the particular uses for which they are intended.

Rock salt occurs at many places in Europe, Asia, Africa and America. At Wielicza, in the Carpathians, there are beds 1200 ft. thick, which have been worked since the eleventh century, the product—as obtained by blasting—being almost pure NaCl. In Cardona, in Spain, there are two hills of rock salt each a mile in circumference. The richest deposits in the world occur in Russia, at Iletzky Zastchit on the left bank of the Ural, in the province of Orenburg; these are 3 sq. km. in area and 140 m. thick. In the British Isles the first deposit of rock salt was discovered at Marbury, near Northwich, in Cheshire, in 1670, many other deposits being subsequently found in the same district.

The preparation of salt from brine springs was carried on at Cheshire during the Roman occupation of Britain, lead pans containing only a few gallons being used. Except that iron pans holding several thousand gallons of brine are now used, the modern process of salt-making carried on in Cheshire is almost the same as that used by the Romans. Shafts are sunk to the marl, which is then tapped by boreholes. If no natural brine is found, water is let down. The dense brine formed sinks to the bottom and is pumped through large iron pipes to the works. More water flows in and large cavities are produced, often causing serious subsidences of land.

Large quantities of salt are obtained by the evaporation of seawater, that of the Atlantic and the Mediterranean containing about 3 per cent NaCl, together with salts of magnesium, potassium and calcium in smaller quantities. The Baltic and Black Seas are poorer in salt, while the Dead Sea contains 8 per cent, and the Great Salt Lake of Utah 20 per cent NaCl. In sunny climates the solar heat is used to evaporate seawater. There are works at the mouth of the Rhone, in the Giraud district, in Italy and in Sicily, where several hundred thousand tons are produced annually by this means.

A unique experiment in solar evaporation is being tested at an inland sea in Mexico. Ponds constructed sprally are so arranged that it takes a year for the brine to reach the centre of the spiral, from which it goes to the crystallisers, where complete evaporation is attained.

Some of the wells in the United States yielding brine for the production of chemicals and evaporated salt penetrate the salt beds several thousand feet below the surface. The deepest on record is the 6000 feet well of the Defence Plant Corporation, which in 1943 began large-scale operation at Natrium, West Virginia, to supply salt brine from which liquid chlorine and caustic soda are produced.

South African Production

Salt production has been carried on in South Africa as far back as the time of Van Riebeek. So far no rock salt has been discovered, sources of supply being confined to numerous salt-pans located in the north and north-western Cape Province and the south-western Orange Free State. There is also a salt pan at Pretoria worked primarily for soda ash.

The salt is recovered from brine, which is pumped from boreholes on to the pan floor. Usually the salt crust formed on the surface during the dry season is scraped off, piled into heaps, drained free of water, crushed or ground, and bagged. Natural brine is formed by the introduction of water and run into a series of shallow pans. The heat of the sun dries out the moisture, leaving a formation of crystals, which are scraped off and sorted into various grades. Quality depends in the first place on the pans themselves, secondly on the manner in which harvesting and grading are carried out, and finally on the subsequent treatment given to the salt. Dependence on solar evaporation confines production to the summer months.

In South-West Africa rock salt occurs as a marine deposit near Cape Cross. Coarse

salt is produced by solar evaporation from salt pans about 10 miles from Swakopmund, almost the entire production being consumed in the territory.

For the production of high-grade salt it is necessary to reduce the presence of certain injurious impurities to an aggregate proportion of not more than ½ per cent. A further object of refining is to produce the physical type of salt most suitable for particular uses.

Three processes, all of which employ artificial heat for evaporating the brines, are used for refining salt. Fairly high-grade salt can be obtained with open pans heated over flues, the temperatures of evaporation being regulated and mechanical stirring applied. Alternatively, vacuum pan evaporation, as practised in the sugar and other industries, may be adopted. By this method a fine-grained high-grade salt can be obtained at a very high rate of production per unit cost. The third method, known as the grainer system, is the most flexible and adaptable process of salt refining. The plant consists of a shallow vat into which live or exhaust steam is passed through submerged coils suspended about a foot from the bottom. A raking mechanism pushes the salt forming at the bottom to the edge of the grainer and over the side. The grainer may be equipped with surface agitators, enabling any desired type of crystal to be obtained.

Hydraulically compressed blocks from both evaporated and rock salt are produced in the United States. Some of the blocks for domestic consumption contain small amounts of chemicals for their medicinal value. Blocks of iodised salt are produced for conditioning cattle, or sulphur and other chemicals may be added. An interesting development in the United States is the growing demand for iodised salt. At present about half of the table salt produced is iodised.

Development in Australian Metals

THE treatment of a million tons of zinc, in a 20-year accumulation of slag at Port Pirie, South Australia, will eventually result in a large quantity being made available on world markets. Negotiations are proceeding between Broken Hill Associated Smelters and the Government of South Australia for facilities to begin the work of extraction.

The project is an important one as it will eventually accelerate development of the Leigh Creek sub-bituminous coal-field. A high-capacity electric power station which will be necessary for the extraction process, will also provide power for domestic consumers, and already-existing industries in the area. After Australia's zinc requirements are met, the balance will be available for export.

Another important development in the field of metals is a new process for the extraction of pure aluminium from Australian bauxite without the use of caustic soda, which was in short supply during the war. At the recent Chemex Exhibition held at Melbourne, a special demonstration of this process aroused much interest. It showed the stages in the production of pure alumina to the metallic aluminium. The company which developed this important process also produced synthetic cryolite from basic materials found in the State of Victoria. Aluminium has recently been in good supply in Australia, due partly to the fact that large quantities have been made available by the Commonwealth Disposals Commission.

Another metal which Australia was compelled through wartime necessities to produce for herself, and which she has since continued to produe, is cemented carbide, one of the most important products yet developed from powder metallurgy. Commencing as a powder, it is transformed under heat and pressure to form tool tips, dies and machine parts with the superhardness necessary for high-speed and low-cost industrial uses. The metal retains its original size and shape and continues to function efficiently for periods up to 100 times longer than that of other metals. It is valuable in saving time usually lost in regrinding and resetting of tools. During the war the metal was made by a Melbourne company which is now serving the needs of peacetime industry. Production has also been carried out in other States of Australia.

INTERNATIONAL CHEMISTRY CONGRESS

Essential Oils Section

THE last section to be formed for the 11th International Congress of Pure and Applied Chemistry, to be held in London from July 17 to 24, is Section 14, dealing with chemistry in relation to essential oils, flavouring materials and cosmetics. The honorary president of this section is M. Robert Henri Bienaimé, of France, who is Président de la Société de Chemie Industrielle and Président du Syndicat de la Parfumerie Française. The chairman of the section is Mr. Roger K. Allen, and the secretary, to whom correspondence should be addressed, is Dr. William Mitchell, Stafford Allen & Sons, Ltd., Wharf Road, N.1.

American Chemical Notebook

From Our New York Correspondent

METHYL ethyl ketone, one of the most widely used solvents in the plastic and lacquer industries, is now being produced commercially on a scale large enough to supply users with tank car quantities, according to an announcement made in New York this week by the Celanese Chemical Corporation. Methyl ethyl ketone is made synthetically from natural gas components and is a colourless liquid, soluble in water, alcohol and ether and miscible with oils. It is ideal for use as an intermediate in the manufacture of organic chemicals and dyes.

* * *

The Rules Committee of the U.S. House of Representatives has cleared for congressional debate legislation to continue until June 30, 1952, the federal support of copper, lead and zinc prices. The proposed subsidy Bill authorises expenditures of up to $80,000,000 (approximately £20,000,000) a year to provide a return of 28 cents a pound for copper, 18 cents a pound for lead and 18 cents a pound for zinc. As long as the market price for these metals remained at these prices no subsidy would be paid. The subsidy, however, would increase as the market price for these metals fell.

* * *

The present premium price plan, in operation since 1942, expires June 30, 1947. The new bill stipulates also that other metals which may be deemed strategic may also come under the plan, though no list of metals which will fall within this category has as yet been drawn up. Administration of the subsidy would be vested in a specially created Division of Mineral Resources within the Interior Department.

* * *

With the retirement of Thomas Coyle, manager of E. I. du Pont de Nemours & Co.'s chlorine products division, which became effective on May 31, after more than 40 years in the chemical industry, the company announced that thereafter its chlorine products and solvents division will be merged into one unit, the chlorine products division, which will be headed by C. B. Shepherd, who is now manager of the solvents division.

* * *

When the freighter, *Golden West*, docked at Pier 17, Clifton, Staten Island, New York, loaded with 3500 tons of ammonium nitrate, authorities thought it wise to minimise the possibility of any explosion and firemen were assigned to stand guard with hose lines from the shore for twenty-four hours a day until the ship left. The freighter, owned by the United States Maritime Commission and chartered by the United States Lines, set sail for Brest, France, on May 27.

* * *

Following a visit to the ship, Third Deputy Fire Commissioner Nathan C. Horowitz, said that the only danger of an explosion, such as recently occurred at Texas City, Texas, lay in a heavy concussion and he remarked that every precaution was taken against such an eventuality. The explosive cargo was taken aboard at Baltimore, Md., and the hatches of the holds in which the ammonium nitrate was stored were sealed tight.

* * *

The Manufacturing Chemists' Association of the U.S., this week published Preliminary Chemical Safety Data Sheet SD-11 on *Perchloric Acid Solution*, the eleventh in the Association's series of chemical product safety manuals. Designed for supervisory staffs, management, and the chemist, the manuals concisely present essential information for the safe handling and use of chemical products. The data sheet on Perchloric Acid Solution gives the important physical and chemical properties of this product; usual shipping containers and methods for their unloading and emptying; container storing and handling; requirements for caution labels; and personal protective equipment.

The new safety manual is available at 20 cents per copy from the Manufacturing Chemists' Association, 608 Woodward Building, Washington 5, D.C.

* * *

Further rises in production of nearly all inorganic chemicals throughout the U.S.A. in March are shown in the latest review issued by the American Bureau of the Census. One of the most significant increases was that of sulphuric acid, the leading item in volume and value, which at 931,217 short tons showed a rise of 4 per cent on the previous month's output and of 24 per cent on the figure a year earlier.

Another striking increase was in nitrogenous chemicals, which, excepting synthetic ammonium sulphate, continued to be produced at approximately twice the rate of a year ago. Typical figures are those of ammonium nitrate, which rose from 42,860 short tons in March last year to 90,333 short tons last March.

The rises in some other directions are illustrated by the following comparison (in short tons) between March this year and March, 1946: Chlorine gas, 117,039 (96,439); hydrochloric acid, 36,993 (26,805); nitric acid, 64,647 (30,899); phosphoric acid; 89,517 (79,500); liquid electrolytic caustic soda, 115,198 (93,335).

Chemicals in South Africa

(From our Cape Town Correspondent)

A GOVERNMENT control which may be established shortly in South Africa is that of soda ash—a commodity used in many industries, especially the manufacture of glass and soap. A small amount of soda ash is produced in the Pretoria district, but the bulk of the Union's requirements is obtained from the Magadi Mines in Kenya. Other countries which formerly imported soda ash from Britain are also making heavy demands on the Magadi Mines, with the result that the Union's quota has lately been greatly reduced. Hence control of soda ash seems inevitable.

* * *

The announcement has been made of a proposed £1,000,000 plant for the manufacture of soda ash in the Union. Marble, Lime and Associaed Industries refers in its annual report to the conclusion of negotiations for the establishment of a soda ash plant, which is to receive encouragement by the Government. The chairman has left for America to obtain plant. Shareholders are to be given subscription rights in the projected Alkali Chemical Corporation.

* * *

As a result of energetic representation by the Transvaal Chemical Manufacturers' Association, all essential oils are now admitted into the Union duty-free. This ruling, which reverses the previous interpretation of the Customs and Excise Act, will result in a large saving to chemical manufacturers in South Africa. This was among the important matters which received the attention of the association during the past year.

* * *

Another issue of marked significance to private chemical enterprise in South Africa was the manufacture and distribution by the Government of DDT. Determined but unsuccessful attempts were made to induce the Government to abandon the manufacture of this insecticide, but it has refused to do so. It is still being urged that the Government is competing with private enterprise in contrast with its declared policy of not doing so. There is little hope of the organised chemical industry in South Africa succeeding in this regard, but a careful watch is being kept on other developments in official circles, and a more strenuous protest will be issued if there is any further encroachment of the Government on chemical manufacturing which it is felt should be left to private firms.

* * *

Towards the end of 1946 a large number of pharmaceutical chemicals were freed from export control by the local authorities. The South African pharmaceutical chemical manufacturing industry has undergone steady development in recent years, and not only is it able to satisfy much of the local demand for certain types of drugs but also to have a sufficient surplus to export to neighbouring territories. The South African manufacturers hope to be able to retain this trade.

* * *

Lubricating oils, greases and other chemicals are being disposed of by tender on behalf of the Union Defence Force by the War Stores Disposal Board. They include calcium chloride, greases and lubricants, muriatic acid, naphtha, coal tar, bitumastic black enamel, torpedo lubricating oil, castor oil, paraffin wax, and other such items. There has been a strong demand in industrial circles in South Africa for these and other items released by the Government for general use.

* * *

British and Union Distributors, P.O. Box 2777, Durban, are a new firm of chemical manufacturers with a factory at Jacobs, Natal. They specialise in stick and liquid belt dressing, feed water treatment compounds, special anti-termite preparations for treating earth and foundations of buildings before erection and timber impregnating oil for the prevention of damage by white ants and borers.

* * *

Atlas Industrial Products, P.O. Box 369, Germiston, are now making magnesium chloride in liquid and anhydrous form. It is being sold for use in flooring and tiling compounds.

* * *

Cement is very scarce in South Africa at present and increasing importation is likely. The profit margin on imported cement may not exceed that allowed to merchants of locally manufactured cement. This was indicated by the Price Controller in advising the Association of Chambers of Commerce that orders were being placed by merchants for the importation of cement.

* * *

The chairman of the Industrial Development Corporation has said that the production of ferro-chrome, chrome steel and chromium alloys could be developed into one of the most important industries in South Africa. He considers that special processes could be developed locally on the basis of the relatively cheap ore instead of following blindly the methods adopted by other countries, which have naturally been influenced by the higher cost of the imported ores. Just as a world market for nickel and for aluminium has been developed, so a very much greater market could be developed for chromium and chromium alloys than exists at present.

Palestine Notes

POLYMER RESEARCH : NEW OIL STRIKES

DR. WALTER P. HOHENSTEIN, Adjunct Professor of Polymer Chemistry and Associate of the Institute of Polymer Research of the Institute of Brooklyn, has arrived in Palestine to supervise the installation of equipment at the Weizmann Research Centre, Rehovot, for the Department of Polymer Research in the new Institute of Biophysics and Physical Chemistry. The total equipment to be installed will cost more than £60,000. An electron microscope, recently developed at the Radio Corporation of American Laboratories, which can enlarge objects more than 100,000 times was purchased last year for the Wiezmann Institute and has been set up in the Brooklyn Polytechnic, where scientists who are later to join the Rehovot Research Centre staff, are now working with it. Other equipment to be installed includes an ultra centrifuge, Tiselius diffusion apparatus, an infra-red spectrograph, a mass spectrograph, an electronic calculating machine, and rubber and plastics processing and testing equipment.

* * *

The countryside in Palestine in the vicinity of lime quarries may soon be freed of the smoke which at present disfigures fields and damages fruit trees. The third of a series of experiments designed to find a smokeless oil burner was recently held in a village and the test, apart from a minor breakdown in the latter stages, was stated to be 90 per cent successful. The smokeless burner is being developed by Messrs. Thermoil, Ltd., of Tel Aviv and the Government has provided the kilns for the experiments. The manufacturers have been assured by the Government that if they produce a reliable smokeless burner, the authorities will do everything in their power to secure the co-operation of the quarries to use it. A Government official stated that he hoped legislation would not be needed to compel the use of such machines. Quarrymen, it was stated, would find them economical and efficient, with about a 50 per cent reduction in running costs.

* * *

Messages from Latakia in Northern Syria report that prospectors had struck oil just below the surface about a mile from the town. An analysis of the strike showed a high fuel production ratio. Reports from other prospectings in Northern Syria showed that the Syria Petroleum Company had made a rich strike in Kurbagh and drilling operations are to begin shortly. Prospectings from various points in Syrian territory suggest shat the vast subterranean oil ocean, lying under the Arabian peninsula, might continue into Syria.

* * *

An electrically driven automatic machine —the invention and patent of a Palestinian engineer—is turning out 10,000 ampoules a day made from alkali-free glass, conforming to the requirements of the pharmaceutical industry and to medical standards, at the Shekef Technical Glass Products factory in the Haifa Bay area of Palestine. Greece, Turkey and other Mediterranean countries are buying these products. Other articles made at the factory are small glass containers, bottles, eye-droppers, tubes and blown-glass ornaments, the latter destined for export, mainly to North America and Australia.

THIOPHENE PRODUCTION

Commercial Process

BY a process newly perfected, depending upon the de-hydrogenation and cyclisation of normal butane, U.S. chemists have found a means of producing thiophene, thiophene thiol and some other by-products sufficiently economically to provide thiophene in commercial quantities at comparatively small cost. An immediate benefit is that broadly based studies of the chemistry of thiophene and its use in pharmaceuticals and fuel will now be possible. Its versatility has long been recognised.

The method, for which Messrs. H. E. Rasmussen and F. E. Day, of the Socony-Vacuum laboratories, New Jersey, are responsible, uses sulphur as the de-hydrogenating agent, followed by cyclisation with sulphur to form the thiophene ring. The reaction, it is thought, progresses through the conversion of butane to butene, butadiene and finally thiophene. The sulphur isolates the hydrogen to form hydrogen sulphide. Associated reactions are the thermal cracking of butane into lighter hydrocarbons, complete de-hydrogenation and sulphurisation of the cracked products to carbon disulphide and the production by polymerisation and sulphurisation of a residuum, consisting of thiophene thiols, thiophene homologues and organic sulphur compounds of high molecular weight.

A typical product of a single operation in a semi-commercial reaction and fractionation system is thus given: Percentages, thiophene, 8; butadiene, 3; butenes, 6; butane, 26; hydrogen sulphide, 37; carbon disulphide, 2; light hydrocarbons, 3; residuum, 15.

GERMAN FERTILISER PLANT

U.S. Army Denies Destruction

FOLLOWING allegation that German fertiliser plants were being destroyed by the Allied Control, General Clay and General Keyes report that: (a) Phosphate fertiliser: There has been no destruction of such plants, and none of the existing plants have or will be declared available for reparations. At present, phosphate fertiliser plant capacity totals 218,000 tons per year of P_2O_5. Of this, 59,000 tons is in the form of basic slag. Requirements for this type of fertiliser total 688,000 tons, leaving a deficit of 470,000 tons. In pre-war years, the basic slag production from the steel industry covered this deficiency. (b) Potash: There has been no destruction of potash mines in the western zones. The Soviets have destroyed potash mines in their zones, but have stated to the Allied Control Council that the mines destroyed were exhausted and had been used for underground production of war materials by the Germans. (c) Nitrogen fertiliser: There has been no destruction of synthetic-ammonia plants or any auxiliary fertiliser conversion plants in the western zones. Although synthetic ammonia is listed as a prohibited industry, the Allied Control Council has authorised its production for German peace-time requirements until exports are sufficient to pay for all imports. Germany has plants sufficient for production of its nitrogen-fertiliser requirements, and deficiencies are due primarily to the basic shortages of coal and power.

As to Austria, General Keyes states that no fertiliser-producing plants in Austria have been or are being destroyed, nor are any contemplated for destruction or removal as a result of quadripartite action. The Austrian authorities have reported that sulphuric-acid production essential for manufacture of superphosphates has been largely eliminated by war damage or by removals by the Soviets.

The fertiliser plant at Hoosbierbaum, part of which was destroyed by bombs, had a remaining annual capacity of 46,000 tons, and the plant at Pischelsdorf, which was lightly bombed, had a remaining capacity of 49,000 tons. These were both removed from Austria by Soviet order early in the occupation. The plant at Deutsche-Wagram, capacity 7350 tons, was partially burned and production has been abandoned. The only remaining plant is at Liesing and has a capacity of 8000 tons. This is under Russian management.

Production of nitrogen in Austria depends upon obtaining sufficient coal from Germany or other sources to permit fuller operation of the plant at Linz, in the United States zone. This is now, because of lack of sufficient coal, producing at a rate of only 15,000 tons pure nitrogen per year. The full installed capacity of such plant is 60,000 tons. Austria's annual domestic requirements are 30,000 tons.

DRUGS FROM KASHMIR

Kashmir is well known for the abundance of raw drugs like belladonna, digitalis, valerian, podophyllum, etc., required for the establishment of a large-scale drug and pharmaceutical industry. Pyrethrum, which is a highly potent insecticide has been successfully grown in Kashmir and there is an increasing area of land under its cultivation in the State.

The Government of Kashmir have already established a Central Drug Research Laboratory at Jammu for research work in botany, chemistry, pharmacology, bacteriology, etc. A branch of this laboratory has been set up in Srinagar for research work in certain directions. A small manufactory with a pilot plant has also been added to the laboratory at Jammu for the production of medicinal preparations. The laboratory and the manufacturing section are at present engaged in the manufacture of a variety of pharmaceutical preparations, injectibles and proprietaries.

It is now proposed to expand the work of the pilot plant and the laboratory with the aim of establishing gradually a large-scale drug industry in Kashmir State. With that purpose in view Investa Industrial Corporation are entering into an agreement with the Government of Kashmir for the flotation of a public limited company registered in Kashmir State, which will take over the laboratory and the manufacturing section and undertake to manufacture pharmaceutical preparations, pyrethrum products and other insecticides.

The manufacture of pyrethrum products and insecticides will be an important objective of the proposed company. On the incorporation of the company, immediate steps will be taken to extend pyrethrum cultivation and increase the pyrethrin content of the pyrethrum flower in order to undertake large-scale manufacture of these products.

Austria wants Ruhr Coal.—A former president of the Austrian Board of Trade, Mr. Taucher, with experts is shortly visiting London to try to obtain some help for Austrian industries. Should they fail to obtain coal supplies for next winter many of the country's factories would have to close down. They hope to secure coal from the Ruhr.

GERMAN GLASS INDUSTRY

THIS report (B.I.O.S. No. 403) is probably one of the best we have seen to date and contains a vast amount of information which is likely to be useful to both the glass technologist and the general scientist alike. The diagrams and indices are well set out, and it is easy to trace the information given on any particular subject.

The majority of German sheet glass is made by the Foucalt process, whereas plate glass is invariably made by batch casting from pots or by ladling. A simple form of the Boudin process is used for the production of rolled plate, "Chance" type machines being employed for the manufacture of Cathedral, ornamental and wired glass; rolled plate tanks are also used for ornamental glass. The wire mesh used in reinforced glass is either of the weldable or non-weldable type. Annealing of plates is generally effected by means of moving rail lehrs although the use of roller lehrs has been reported in two works.

Glass Fibre

Glass fibre is produced in the form of staple, wool, and continuous filaments. Staple is prepared by the Owens-Corning process and wool is produced by the centrifugal and Owens-Corning methods. There are three methods of manufacturing continuous fibre, i.e., drawing over rods, rotating perforated plates and the Owens-Corning processes. Some extremely useful formulæ are given in this report, and the composition of glass manufactured by the Deutsche Tafelglas A.G. of Witten-Grengeldanz is reported to be as follows:—SiO_2 71.28 per cent, Ca0 9.5 per cent, $A1_2O_3$ 0.84 per cent, MgO 2.2 per cent, Fe_2O_3 0.09 per cent, SO_3 0.83 per cent, $Ti0_2$ 0.02 per cent, Na_20 14.24 per cent, 99.00 and a typical batch mix is as follows:—sand 728 lbs., dolomite 95 lbs., sodium carbonate 251 lbs., sodium sulphate 31 lbs., limestone 121 lbs., anthracite 28 ozs. Both the sand and dolomite are controlled in respect of moisture content.

Watch glasses, spectacle lenses and coloured plate glass are all made at the Deutsch Spiegelglass A.G. werk, Grünenplan. Watch glasses are manufactured by means of the following devices. Cut circles of flat glass are placed in each of 25-30 moulds carried on a rotating table, the moulds being made of a fine-textured plaster. The table is rotated so that each of the moulds is brought in turn within the firing zone causing the glass to melt and take the shape of the mould. The table is then rotated still further where the glass shapes are removed from the mould supports and transferred to a simple pan cooler. Edging is carried out by means of a revolving abrasive wheel which is made adjustable so that the angle of the bevel can be changed at will.

Eye-glass lenses are prepared by first making a flat glass circle which is then pre-heated in a furnace prior to placing on a cast-iron mould. This mould is positioned under a mechanically operated plunger which acts as a male to the female imprint of the mould. Flame jets are directed on to the glass, the plunger is pressed down, and after withdrawal the blank lens is removed and annealed. No new information is given in the report on the grinding and polishing operations concerned in the preparation of spectacle lenses.

Coloured Glass

The composition of glass for welding equipment is given as follows:

SiO_2 64 per cent; Sb_2O_3 0.4 per cent; NiO 0.4 per cent.

Na_2O 16.5 per cent; MnO 3.5 per cent; Co_2O_3 2.4 per cent.

CaO 9.5 per cent; FeO 1.8 per cent; Cu_2O_3 0.8 per cent; Cr_2O_3 0.4 per cent.

The Vereinigte Werke use the following composition for all coloured glass:

Sand 100 kg., Saltcake 1.5 kg., soda 36 kg., felspar 1.33 kg., limestone 28 kg., to which the following colouring media are added as required:

For cobalt blue glass (dark), cobalt oxide, 1800gm., the tint being modified by appropriate reduction of colouring matter.

For dark amber glass, powdered anthracite 6 kg., powdered sulphur 2 kg.

For medium amber glass, powdered anthracite 4 kg., powdered sulphur 1½ kg.

For light amber glass, powdered anthracite 4 kg., powdered sulphur 0.2 kg.

For green glass, potassium chromate 7 kg. or barium chromate 6 kg.

For violet glass, manganese oxide (90 per cent) 25 kg.

For blue glass, sulphate of iron 60 kg.

Many other interesting details are given in this report although one criticism may be that it includes comparatively little information on fundamental research work in this field. Nevertheless, this publication should be studied by all technologists especially those engaged in glass manufacture and fabrication.

SWEDISH WOOD PULP INDUSTRY

SWEDISH timber production in 1937 was 41.2 million steres (cu. metres), its disposal being as follows (in million steres): fuel wood 11, saw-mills 11, pulp 15, and miscellaneous 4.2. The pulp is produced either by chemical or mechanical means, and in 1940 the total was 3,725,000 tons, of which only 850,000 tons were pulped by the latter method, the figures for chemically-produced chemical pulp being: 1.17 million tons soda pulp, 1.7 million tons sulphite pulp. At about that time there were 68 chemical pulp factories, and 28 producing by mechanical means. The following detailed figures for 1939 may be of interest:

	tons	1,000 crowns (Swedish)
Mechanical pulp, wet	634,599	51,365.6
dry	54,981	4,626.5
Chemical pulp:		
Bleached sulphite	463,736	98,191.7
Unbleached wet	265,005	36,359.7
Unbleached dry	751,069	112,077.3
Bleached soda	127,062	25,073.0
Unbleached wet	229,942	28,373.0
Unbleached dry	609,793	72,456.0
	3,136,187	428,522.8

The following prices, relating to Swedish crowns per ton, were fixed on July 1, 1946: textile pulp (470); paper pulp (bisulphite bleached) 450, unbleached 340; soda pulp 330; wet mechanical 170 (newspaper grade). After a temporary reduction, through changes in monetary policy, these prices were restored last November.

The present demand is world-wide, and only lack of fuel and labour retards production. Only a small part of the pulp produced in Sweden is used by manufacturing industries in that country. Before the war 1,290,126 tons of dry chemical pulp were exported, the figure for mechanical pulp being 239,217 tons. By 1945, Sweden had recovered from the serious decline of the war period to the extent of exporting 916,780 and 121,187 tons respectively; it is estimated that the 1946 figures will indicate that the pre-war level has already been fully regained.

Under a twelve-month agreement with France, dating from July 1, 1946, Sweden has agreed to supply that country with 210,000 tons of wood pulp, including 50,000 tons of viscose, 60,000 tons of soda pulp, 80,000 tons of wet and bleached bisulphite, and 20,000 tons mechanical pulp.

Alcohol and Formaldehyde in Spain

THE importance of methyl alcohol and formaldehyde to Spain is such as to merit an editorial comment in *Ion*, 1947, *7*, 69-70. Production of methyl alcohol was stimulated about two years ago by the scarcity and rising price of gasoline, and was at first obtained mainly by distillation of wood waste in connection with the production of special carbons for gas generators. The Union Chimica del Norte de España subsequently installed a large plant for production of synthetic methyl alcohol with a view to converting it into formaldehyde for use in the manufacture of plastics. The latter part of the programme was apparently never fully realised, since the large supplies of cheap methyl alcohol coming on to the market attracted comparatively few buyers, and the scarcity and high cost of gasoline was seemingly no incentive to purchase. The only other use was as a denaturant, and in accordance with a special decree, the percentage of methyl alcohol used in denaturants was raised to 70 per cent.

More recently the position has changed. The Union Chimica's formaldehyde plant has started operations and absorbed a large proportion of the company's synthetic alcohol. Meanwhile, the comparatively small distillers of alcohol, and producers of gas generator charcoal have in many cases ceased production. Furthermore, the Union Chimica are now manufacturing synthetic phenol for plastics, so that the whole of its output of alcohol is now being absorbed. The only other producer of methyl alcohol on any considerable scale, El Irati, is now also using the greater part of its output for production of formaldehyde. The general conclusion is that State intervention, through the Sindicato Nacional de Industrias Quimicas, may be necessary in the national interest.

The improvement now expected in the quantity of supplies of carbon black from the U.S.A. may soon be accelerated by the new method of carbon black recovery from natural gas developed in the research laboratories of the Columbian Carbon Co., which is now in use. The new product, described as Statex K, is obtained by adaptation of the furnace method in which cold hydrocarbon "make" gas is introduced into a furnace in which turbulent blast gases are burning at a temperature of up to 2400°F. The rapid mingling of the hot and cold gases results in the formation of carbon particles, the structure of which can be controlled. This process permits a great economy in the size of the plant required.

A CHEMIST'S BOOKSHELF

The Chemical Constitution of Natural Fats. T. P. Hilditch. Chapman and Hall Ltd., 1947. 2nd edition pp. 527. Index pp. 24. 45s.

It is only about twenty years since Professor Hilditch and his collaborators at Liverpool University have developed chemical methods which led to quantitative statements of the different component glycerides present in natural fats. These methods lead to the generalisation that the fatty acids are distributed remarkably evenly and widely among the glycerol molecules, and that saturated and non-saturated acids are linked in mixed glycerides according to a definite association ratio. The tendency towards maximum even distribution of the acyl radicals throughout the triglyceride molecules is particularly marked in vegetable fats, while animal depot fats containing more than about 35 per cent of saturated acids apparently do not conform to this rule.

For the classification of natural fats the study of individual component acids is however, more important than their mode of union. The detailed data available emphasises the fact that natural fats tend to align themselves, by their component acids, in groups according to their biolcgical origin. The fats of the simplest and most primitive organisms are usually made up from a very complex mixture of fatty acids, while, as biological development has proceeded, the major component acids of the fats of the highest organisms have become fewer in number.

The sequence of classification adopted in the first edition (1940) has been maintained. The component acids of fats of aquatic flora and fauna, land animals and vegetable fats are discussed in this order. A good deal of fresh information has been added to these chapters as well as to the following chapters on component glycerides and individual fatty acids. The immense amount of detailed and exacting work in the collection of the data and the magnitude of painstaking research in bringing the present second edition up to date, can be gathered from the fact that the fat composition of some 700 species is given; in several instances these numbers include fats from different parts of the same animal or plant.

The last chapter on experimental technique has been revised and expanded for this edition. A fairly full account is given of the methods for the separation of mixed fatty acids including low temperature crystallisation from solvents and ester-fractionation and the use of hydrogenation for the determination of Tri-C_{18} glycerides. Illustrations of experimental apparatus are included as well as tabulated data of investigation results. Emphasis is put on the methods of interpretation of ester-fractions involved in the determination of component acids. Professor Hilditch is to be congratulated on the present revised edition of his valuable book for the renewed stimulus it provides for the reader and the guide it gives to the research worker.

M. K. Schwitzer.

Chemistry for the Executive. By Ralph K. Strong. New York: Reinhold Publishing Corporation (London: Chapman and Hall, Ltd.) 1946. pp. vii + 445. 36s.

Reminiscent of many previous attempts in America to provide canned (and dehydrated) versions of the world's classical literature in one volume is this "layman's guide to chemistry," which gives rise to a number of interesting speculations. The worship of technology in America is no doubt the excuse for this offering, but whether the "Mr. Executive," who throughout the book keeps up a gallant fire of questions to the chemist (starting with "How many chemical elements are there?" until, so confident is he of his chemical background, that he attempts such subjects as "What about everlastingness and renewability of natural sources?"), finishes the course a better executive than when he began, seems extremely doubtful. In this country the executive, we venture to predict, will prefer to leave chemistry to the works chemists on the understanding that they will leave administration to him. If golf does not cater adequately for his recreational needs, there is, of course, no reason why he should not try "Chemistry for the Executive," and if he very reasonably detests the questionnaire method in which the information is imparted by the heads of the Department of Chemistry, Rose Polytechnic Institute, Terre Haute, Indiana, the comprehensive index will enable him to short circuit the verbiage.

Home News Items

St. Just Chemicals.—Theodore St. Just and Co., Ltd., advises that it has now removed to Whitefield, Manchester, to which address all communications should now be sent.

Electrocuted.—Accidental contact with a power cable carrying heavy voltage caused the death of Charles Kelly (38) a worker at Acklain Ironworks, Doncaster, of Dorman Long and Co., who was electrocuted while loading slag on a conveyor belt.

Glasgow Research Department?—The Lord Provost of Glasgow (Sir Hector M'Neill) is to call a meeting of the city's post war planning committee to discuss the formation of a municipal department of industrial research.

I.C.I. Welcome Home.—Some 1500 people were guests of the directors of I.C.I., Ltd., at a party given on Monday evening at the Connaught Rooms, Great Queen Street, London, to welcome the return to the metropolis of the last of the London staffs who during the war were evacuated to all parts of the country—" from Welwyn to Windermere." Lord McGowan presided.

Dwindling Tin Stocks.—A marked decline in tin stocks in the U.K. in April is recorded by the Ministry of Supply. Tin metal stocks of 9177 tons held by the Ministry at the beginning of the month had declined to 7021 tons by April 30; consumers' stocks fell from 3930 tons to a calculated figure of 3726 tons, which is likely, however, to prove considerably larger than the stocks actually held.

Polish Coal.—The prospect of an addition to British coal supplies of possibly 250,000 tons from Poland in the next 12 months is held out by the agreement signed on Monday by the U.K. and Polish Governments providing for trade between the two countries in the next three years to the value of some £60 millions. Polish imports from Britain will include chemicals, dyestuffs and ferrous alloys.

Castings Output Restricted.—The paucity of supplies of raw material to the light castings industry, which has resulted in a reduction of output, is the subject of a strongly worded protest sent to the Minister of Supply by the Amalgamated Union of Foundry Workers. The national council of the union, announcing this, states: " We are determined to explore the cause of the shortages . . . . In our opinion it is nonsense to operate trainee schemes, dilution, up-grading and the introduction of foreign labour if our own members are forced to sign on at the labour exchanges."

Census of Distribution.—June 15-21 this year is the week chosen for the figures relating to employment and wages and delivery vehicles and staff on which the pilot census of distribution to be taken by the Government early next year will be based. In specified areas all retailers, wholesalers, motor traders, caterers and service traders will be required to supply information.

Fatal Explosion. — The Birmingham coroner (Dr. W. H. Davison) last week opened and adjourned until June 19 the inquest on Thomas Lyndon, 33, of Dartmouth Road, Selly Oak, Lyndon, a mixer at the I.C.I. works, Witton, who met his death in an explosion at the mixing shed there on June 3 " This is the second fatality at the same place in a very short time," said the coroner. The dead man's workmate is still in hospital as a result of the explosion.

Tin Stolen at Liverpool.—Ten tons of tin ingots, worth £4,400 were stolen recently from a dockside warehouse at Liverpool by a man who arrived with a lorry and " official " papers purporting to be an authority from the Ministry of Transport. The deception was not discovered until confirmation of the consignment was sent to the firm supposed to have received the metal. The driver was unknown and the lorry carried false registration plates.

900 Fuel Technicians.—More than 900 will be employed by the National Coal Board in the research and application of improvements in coal utilisation, including the reduction of ash content. This information was given by Sir Charles Ellis (scientific member of the Board) to the Parliamentary and Scientific Committee, at their last meeting. Sir Charles said the Board had taken over 900 workers engaged in this branch of the industry and " was building up slowly."

Hungary Seeking Chemicals. — Heavy chemicals will form a substantial part of the export programme from this country to Hungary, to enable which a credit of £500,000 has just been negotiated in London by the Hungarian National Bank. The loan has been approved by the Treasury and accorded by five London banking firms. It will be offset to some extent by setting aside some of the currency earned by Hungarian exports to this country. Although the primary objective will be the purchase of wool, rubber and jute, heavy chemicals are also high in the list of Hungarian requirements, especially chemicals for the development of the Hungarian leather industry.

Personal

MR. R. M. WINTER, M.Sc., has been appointed Research Controller of I.C.I. as from April 10, 1947. Mr. Winter succeeds Dr. Roland E. Slade, who retired from the position in January, 1946. Born in 1896 at Coldstream, Berwickshire, he served with the New Zealand forces throughout World War I, after which he resumed his studies and began research work in London. In 1920 he went to New Zealand where he received his M.Sc. Returning to England in 1921 with an 1851 Exhibition Science Research Scholarship, he began work at the Rothamsted Experimental Station at Harpenden, Herts. At the beginning of

Mr. R. M. Winter.

1928 he joined the Billingham Division of Imperial Chemical Industries, Ltd., and from then until 1931 was responsible for the research and design work which preceded the construction of the Cassel works, Billingham South Site. In 1931 he went to the General Chemicals Division as research manager, and in 1937 joined the staff at I.C.I. head office, working with Dr. Slade in the Central Research Department.

CAPTAIN RUDOLPH DE TRAFFORD, director of a number of companies including Manchester Oil Refinery, has been appointed deputy-chairman of Atlas Assurance.

MR. JOHN GIBSON MUIR has been appointed secretary of Lever Bros., Port Sunlight, Ltd., in succession to Mr. A. Watson, who has been elected a director. Mr. Muir joined the company in 1923.

DR. J. S. ANDERSON, senior lecturer in inorganic chemistry at Melbourne University, has resigned in order to become senior principal research officer at the Atomic Energy Research Establishment, Berkshire. Dr. Anderson was educated in this country, and went to Australia in 1938.

DR. HAROLD HARTLEY, technical director of Radiation, Ltd., Birmingham, will be the next president of the Institution of Gas Engineers in succession to Mr. George C. Pearson, chief engineer, Birmingham Gas Department. He is the first president to be elected from the utilisation side of the industry.

LIEUT.-COL. W. D. GIBBS has been appointed chairman and managing director of British Emulsifiers in succession to Mr. G. S. James, who has resigned. The secretary, MR. R. H. STEWARD, has become a director.

DR. W. J. HICKINBOTTOM, who has been lecturer in chemistry at Birmingham University since 1927, has been appointed to the readership in organic chemistry at Queen Mary College.

DR. F. C. TOMPKINS, assistant editor to the Faraday Society, and lecturer at King's College, has been appointed to the readership in physical chemistry at the Imperial College, the appointment to take effect from October 1.

DR. JAMES F. SPENCER, who has retired from Bedford College, where he has been Professor of Chemistry since 1927, has been honoured with the title of Professor Emeritus of Chemistry in the University of London.

MR. G. M. TURNER has been appointed a director of De La Rue Insulation, Ltd.

MR. H. W. HARTOG, of Baarn, Holland, has been appointed chief research chemist to Messrs. Houseman and Thompson, Ltd., Newcastle-on-Tyne.

The first woman president of the Pharmaceutical Society of Great Britain, MRS. JEAN KENNEDY IRVINE, was elected unanimously by the Council in London last week.

Mrs. Jean Kennedy Irvine.

E. C. R. SPOONER, D.Sc., technical adviser and director of research to Sutcliffe Speakman & Co., Leigh, Lancs., has been appointed to the chair of mining and metallurgy at Adelaide University.

Overseas News Items

Dyes Control in France. — A Government-controlled agency to import and distribute dyes, has recently been established by the French Government.

DDT to be Made in Egypt.—American expert advice and supplies of equipment have been requested by the Egyptian authorities in connection with the proposed manufacture of DDT in Egypt.

Malayan Tin.—Malaya exported 1700 tons of tin in May, of which 900 tons went to the continent of Europe, and 400 tons each to Canada and India. Total shipments this year amount to 8800 tons.

Franco-Dutch Trade.—France is to supply to Holland soda and phosphate, among other goods, under a recently signed trade agreement. In exchange, she will receive tin and rubber.

Chlorine Monopoly Charge. — Nine American companies and nine private persons have been charged with conspiracy to restrain and monopolise chlorinating equipment manufacture and distribution.

British Materials for Italy.—The British export quota of raw materials for the Italian chemical, iron and steel and engineering industries is to be increased as a result of the Anglo-Italian trade and monetary talks just concluded in Rome.

U.S. Soap Lather Improver.—It is reported from the U.S. that a soap with an improved lather has recently been marketed. The soap is said to be treated with nitric oxide prior to the salting out process.

Nine-Mile Blast.—Two are missing and nine persons were injured by an explosion in an Edinburgh, Pennsylvania, chemical plant, part of which was concerned with the production of dynamite. Two buildings were wrecked, and windows nine miles away were smashed.

American Fertiliser Industry. — The average number of wage earners in the U.S. fertiliser industry rose from 18,800 in 1939 to 24,000 in 1946. The average work week was 35.8 hours in 1939, 45.1 hours in 1945, and 42.2 hours in 1946. The labour cost per ton increased 60 per cent over 1939.

German Synthetic Fuel.—Production of synthetic fuel in the Soviet occupation zone of Germany, largely for consumption in the U.S.S.R., according to Berlin reports, is at a level of 80,000 tons monthly, although the former large producing plant, the Leuna works have, in the main, been converted to the manufacture of chemical products.

U.S. Coal for Britain.—It is reported from Washington that the U.S. will send 600,000 tons of coal to Britain during July and August.

German Chemical Exchange.—The mutual delivery of chemical products has recently been arranged between representatives of the U.S., British and French zones of Germany.

Firestone Rubber Co. of America.—This company is to establish a plant at Finsbury in South Australia, and will employ 600 to 800 men when it comes into full operation.

E. African Pyrethrum Price.—Because of the competition in synthetic insecticides, the East African Pyrethrum Board has recommended that growers in Kenya should accept a lower price for their crop.

New Paper Mill for Brazil.—Brazilian and Italian joint interests are to erect a new paper mill in Sao Paulo, Brazil, to produce high-quality paper for commercial use.

New Cotton Research Station. — A £200,000 cotton research station is to be started in Uganda to co-ordinate the Empire Cotton Growing Corporation's activities, said Lord Linlithgow, the president, at the Corporation's annual meeting on June 3.

Another Groundnut Scheme?—The Colonial Office is sending to Gambia, the Gold Coast and Nigeria a mission of experts to survey the possibility of reproducing in the West African territories a groundnut cultivation scheme similar to that now in progress in East Africa.

New U.S. Synthetic Resin Factory.—High-grade synthetic resins, in particular phenol formaldehyde, are to be produced at the Portland, Oregon, plant of the U.S. Plywood Corporation. An additional research laboratory will be established in conjunction with the new unit.

German Fairs. — According to Radio Moscow, the Leipzig Autumn Fair will be held during the first week of September. As the bi-zonal trade fair is taking place in Hanover from August 18 till September 7, two very important exhibitions of German products will be shown simultaneously.

French Iron and Steel. — During February, French iron and steel production amounted to 361,000 tons of cast iron (377,000 in January), 440,000 tons of steel in bars and castings (448,000) and 327,000 tons of rolled steel (312,000). Iron-ore mines produced 1,438,597 tons of ore as against 1,629,677 in January.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ANGLO-AMERICAN PHARMACEUTICAL CO., LTD., Croydon. (M. 14/6/47). April 29, series of first debentures for £7500 1st series and £2,500 2nd series, present issues respectively £4,500 and £350; general charge. *£6,045. December 31, 1946.

Satisfactions

ANGLO-AMERICAN PHARMACEUTICAL CO., LTD., Croydon, (M.S., 14/6/47). Satisfaction May 2, of debenture stock registered April 4, 1932, to the extent of £7,653 the amount issued, the remainder having been cancelled.

Increases of Capital

The nominal capital of **United Plastics and Chemicals (London) Ltd.**, has been increased beyond the registered capital of £100, by £4,900, in £1 ordinary shares.

The nominal capital of **Pest Control, Ltd.**, Harvey's Garage, Hauxton, Cambs., has been increased beyond the registered capital of £110,000, by £150,000, in £1 ordinary shares.

The nominal capital of **Whitall Products Co., Ltd.**, Dye and Chemists' sundries manufacturers, St. Albans, has been increased beyond the registered capital of £1,200, by £800 in 5s. shares.

The nominal capital of **L.A.C. Manufacturing Co., Ltd.**, chemical manufacturers, etc., 12, Westbourne Street, W.2., has been increased beyond the registered capital of £1,000, by £5,000, in £1 shares.

Change of Name

The name of **Sandux Ltd.**, manufacturers of lubricants, wood preservatives, disinfectants, etc., 4, Broad Street Place, London, E.C.2., has been changed to Rowands, Ltd., as from April 11, 1947.

Company News

The Avon India Rubber Co. is to make a gift of 10,000 of its ordinary shares to 200 long-service employees. The shares are quoted on the Stock Exchange at about 86s. each.

The name of **De La Rue Plastics, Ltd.**, 84/86, Regent Street, London, W.1, has been changed to British Moulded Plastics, Ltd., as from March 28, 1947.

W. Ottway and Co., Ltd., optical and scientific instrument makers, has announced the issue of £150,000 share capital in 750,000 shares at 4s. each.

Greeff-Chemicals Holdings is to pay a final 1946 dividend of 8¾ per cent, plus a bonus of 5 per cent, making a total of 17½ per cent for the year. Net profit was £29,784, compared with £21,707 for 1945.

William Gossage and Sons, controlled by Lever Brothers and Unilever, is increasing its 1945 tax-free dividend from 15 per cent to 20 per cent. Net profit for 1946 is £211,343.

Joseph Crosfield and Sons, a member of the Lever Brothers and Unilever group is increasing its 1946 ordinary dividend from 25 per cent, tax-free, to 35 per cent. Net profit has risen from £675,660 in 1945, to £756,000.

Hardman and Holden, Ltd., chemical manufacturers, have authorised the issue of £150,000 share capital comprising 90,000 ordinary shares at 5s. each, and £127,500 of ordinary stock (transferable in units of 5s.).

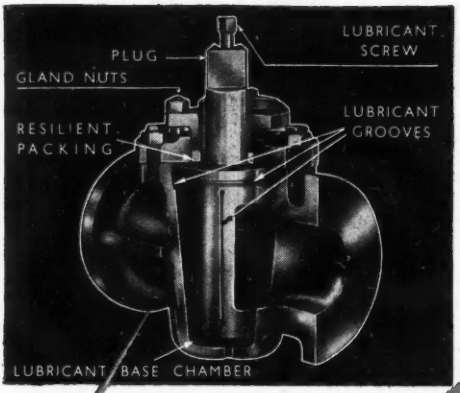
Shell Transport and Trading is increasing its final dividend for 1946 to 5 per cent, thus making a total distribution of 7½ per cent tax-free, as against the 6¼ per cent paid last year. Net profit, after providing for taxation, amounts to £2,587,219; last year's figure was £2,205,229.

New Companies Registered

Hughes Hardy & Co., Ltd. (434,985).—Private company. Capital £1000 in £1 shares. Manufacturers of chemicals, gases and disinfectants, etc. Directors: H. and Mrs. G. Woodward. Registered office: 30 Bridlesmith Gate, Nottingham.

Bio-Cosmetics, Ltd. (435,738).—Private company. Capital £1000 in £1 shares. Manufacturing and research chemists, beauty specialists, etc. Directors: C. T. Howard and Lucien F. A. Howard. Registered office: 310 High Holborn, W.C.1.

Northern Proprietaries, Ltd. (N.I.2313).—Private company. Capital £2000 in £1 shares. To acquire the business of a wholesale chemist and manufacturer and distributor of medicines and chemical preparations now carried on by James Donaghy at Church Street, Ballymoney, as "The Northern Proprietary Company." Directors: James Donaghy, Colerraine Road, Ballymoney; and S. Haydock, 10 Townhall Street, Belfast.



VITAL FOR POSITIVE SEALING

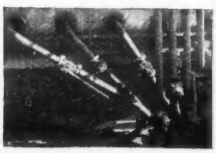
The LUBRICANT SEALS *against Leakage . . .*

In the 'Audco' Valve the plug is positively but resiliently seated and the lubricant, besides sealing it against leakage, reduces the friction of turning. If stuck through disuse, the valve—again because of the lubricant—can be eased and turned by the application of pressure. All 'Audco' Valves are tested hydraulically to ensure perfection of manufacture, correct assembly, absence of porosity and uniform ease of operation. Your own Inspectors are welcomed to be present during testing, and testing certificates will always be furnished on request.

AUDCO
Lubricated
VALVES

6" 'Audco' Valves on Salt Liquors.

A typical 'Audco' Installation at a Chemical works.



SERVING ALL FIELDS
FOR ALL PRESSURES
AND TEMPERATURES

AUDLEY ENGINEERING CO. LTD.

NEWPORT, SHROPSHIRE, ENGLAND

Telephone : NEWPORT, Shropshire 3246

M-W.50

Peboc, Ltd. (434,935).—Private company. Capital £50,000 in £1 shares. Manufacturers of fine chemicals, fertilisers and agricultural chemicals, etc. Subscribers: M. Heilbut, I. Crosse. Solicitors: Wild Collins & Crosse, 87 Duke Street, London, W.1.

Athermon, Ltd. (435,801).—Private company. Capital £40,000 in £1 shares. Manufacturers of and dealers in chemical substances and products, plastics, etc. Directors: L. A. Paisner and A. G. N. Hancock. Registered office: Station Road, Merton Abbey, S.W.19.

A. P. Sampson, Ltd. (435,961).—Private company. Capital £5,000 in £1 shares. Consulting, analytical, manufacturing, pharmaceutical and general chemists, etc. Directors: P. Sampson; Mrs. Edna M. Sampson and P. Caswell. Registered office: 83, High Town Road, Luton.

Halstead Woodward & Company, Ltd. (435,444).—Capital £5000 in £1 shares. Wholesale manufacturing, analytical and consulting chemists, etc. Directors: G. W. Halstead, S. Woodward and C. H. B. Bassett. Registered office: 81 Castle Street, Hinckley, Leics.

Sulfa Chemical Industries, Ltd. (435,388).—Capital £1000 in £1 shares. Manufacturers, importers and exporters of and dealers in chemicals, chemical products, soap, etc. Subscribers: L. L. Freeman and M. Baker. Registered office: 15 Whitehall, S.W.1.

Grassick's Pharmacy, Ltd. (435,522).—Private company. Capital £1000 in £1 shares. Consulting, analytical, manufacturing, pharmaceutical and general chemists, opticians, etc. Directors: Wm. J. Samuel and Mrs. Elsie R. Samuel. Registered office: 14 Queen Street, E.C.4.

Plasticia, Ltd. (435,172).—Private company. Capital £1000 in £1 shares. Manufacturers of plastic materials, chemicals and chemical products, etc. Directors: L. Cohen, G. Garnham and M. Elton. Registered office: 8 Talbot Mansions, Museum Street, London, W.C.1.

Aprola, Ltd. (435,645).—Private company. Capital £3000 in £1 shares. Manufacturers of and wholesale and retail dealers in chemicals, salts, acids, alkalis, drugs, etc. Directors: Geo. T. and Mrs. Joan M. Wearing. Registered office: 28 Kennedy Street, Manchester, 2.

A. J. Manning, Ltd. (435,960).—Private company. Capital £3,000 in £1 shares. To acquire the business of a pharmaceutical chemical engineer carried on by Alfred J. Manning at Wembley Park. Directors: J. Manning; Mrs. Naida A. R. Manning; F. Thomas, and H. Pickering. Registered office: 2, Bridge Road, Wembley Park.

Shepherd's Aerosols, Ltd. (435,619).—Private company. Capital £25,000 in 24,000 shares of £1 and 20,000 shares of 1s. Manufacturers of and dealers in apparatus for disinfecting air and sterilising fittings; engineers, manufacturing chemists, etc. Subscribers: C. A. Garrett and M. I. Wordley. Solicitors: Linklaters & Paines, E.C.

Herculoid, Ltd. (435,928).—Private company. Capital £2,000 in £1 shares. To acquire the sale and application of anti-corrosive substances carried on by John Thompson-Kennicott Ltd., at Ettingshall, nr. Wolverhampton. Directors: J. H. N. Thompson; C. J. Carter; J. W. Cragge, and D. F. Whittle. Registered office: Ettingshall Engineering Works, Ettingshall, Wolverhampton.

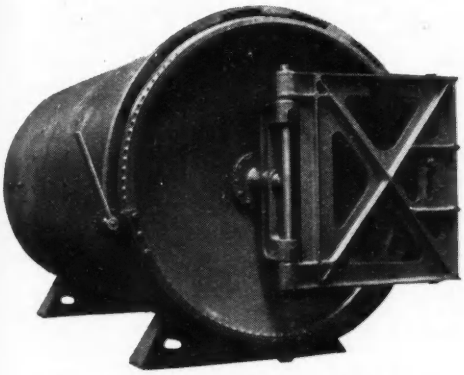
British Chemical Prices

Market Reports

MARKET conditions show little change on the week, and the supply position remains more or less on the same plane as reported for the past month. Prices too are steady and unchanged. Inquiries for shipments continue to be on a fairly substantial scale, but actual bookings are severely limited by the inability to offer firm delivery dates. The position of containers is also difficult in this connection. The coal tar products market has no special feature, and business is reported quiet.

MANCHESTER.—Steady trading activity has been reported in both light and heavy chemicals on the Manchester market during the past week, and very firm price conditions are reported in virtually all sections. Alkalis and a wide range of other chemicals are being absorbed in substantial aggregate quantities by textile bleachers, dyers and finishers, and a steady demand from the rubber, glass and other leading outlets has also been reported. Fresh inquiries from home users as well as on export account have been fairly numerous during the past few days. In the tar products market most descriptions of light and heavy goods are going steadily into consumption.

GLASGOW.—Busy conditions continued in force in the Scottish chemical trade during the past week. The home trade was very active in all classes of light and heavy chemicals with a pronounced demand for sodium chlorate, technical white oil, china clay, bleaching powder and whiting. In the export market a considerable number of orders have been booked including those for epsom salts and all mineral acids. Inquiries continue to be numerous. In retrospect the past week has been one of the best weeks for a very considerable time.



IMPREGNATING VESSEL FOR PRESSURE OR VACUUM
'F.Y.T.' SELF-SEALING QUICK ACTING BOLTLESS DOOR

HYDRAULIC EQUIPMENT
HYDRAULIC & POWER PRESSES
CHEMICAL PLANT
RUBBER MACHINERY
WELDED FABRICATION WORK
CLASS "A" PRESSURE VESSELS
SHELL TYPE BOILERS
STEAM RAISING EQUIPMENT

FOSTER YATES & THOM LTD

Heavy Precision Engineers

BLACKBURN ENGLAND

J. M. STEEL & Co., Ltd.

Abrasives	Dehydrated Castor Oil	Polishing Rouge	Sodium Sulphate desiccated
Acidproof Cements	Diammoniumphosphate	Potassium Bichromate	Solvents
Antioxidants	Ethyl Cellulose	Preservatives for Glues, etc.	Strontium Salts
Asplit Impervious Cement	French Chalk	Resins (synthetic)	Synthetic Glues
Barytes Substitute	Lead Nitrate	Rubber Accelerators	Talc
Carbonate of Potash	Manganese Borate	Sodium Acetate	Temperature Indicating Paints and Crayons
Caustic Potash (all grades)	Methyl Cellulose	Sodium Bichromate	Thio Urea
Cellulose Adhesives	Methylene Chloride	Sodium Chlorate	Wax Substitutes
Coumarone Resin	Oxalic Acid and Salts	Sodium Nitrate	Wood Flour
Cryolite (Synthetic)	Plasticisers	Sodium Nitrite	Zinc Chloride, Etc., etc.

Head Office :
"Kern House" 36/38, Kingsway,
LONDON, W.C.2

Branch Office :
51, South King Street,
MANCHESTER 2.

Telephone:
Holborn 2532-3-4-5 *Blackfriars* 0083/84

Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Method of forming pellets of phthalic anhydride and the like substances and the pellets of phthalic anhydride and like substances resulting from said method.—Monsanto Chemical Co. July 19, 1943. 9697/47.

Catalytic hydroxylation of olefinic compounds.—N.V. de Bataafsche Petroleum Maatschappij. Dec. 19, 1944. 9621/47.

Emulsions.—National Chemical Products Proprietary, Ltd. Oct. 30, 1945. 26895/46.

Recovery of silver from solutions.—Permutit Co., Ltd. Nov. 5, 1945. 30697/46.

Recovery of metal compounds from solutions.—Permutit Co., Ltd. Nov. 3, 1945. 30698/46.

Substituted para dioxanes.—Standard Oil Development Co. Nov. 3, 1945. 29165/46.

Polykis copolymer.—Wingfoot Corporation. Nov. 5, 1945. 11810/46.

Clearing of magnetic heavy media.—American Cyanamid Co. Nov. 8, 1945. 26962/46.

Acrylamide and method of producing same.—American Cyanamid Co. Nov. 8, 1945. 28665/46.

Cellulose derivatives.—British Celanese, Ltd. Sept. 11, 1945. 25830/46.

Crystal formation.—Brush Development Co. Nov. 10, 1945. 33118/46.

Crystal formation.—Brush Development Co. Nov. 10, 1945. 33119/46.

Manufacture of sulphuryl chloride.—E.I. Du Pont de Nemours & Co. Nov. 8, 1945. 33321/46.

Manufacture of polyazo dyestuffs.—J. R. Geigy, A.G. Nov. 9, 1945. 33219/46.

Producing sheetings of a water-soluble film-forming material.—General Aniline & Film Corporation. Nov. 8, 1945. 25363/46.

4, 4-bis (pyrazolone-l-carbamide and thiocarbamide) coupler for colour photography.—General Aniline & Film Corporation. Nov. 8, 1945. 29262/46.

Process of producing foils and films of polymeric-n-vinyl pyrrole compounds.—General Aniline & Film Corporation. Nov. 8, 1945. 29902/46.

Polymerisation in aqueous dispersion of polymerisable organic compounds.—B. F. Goodrich Co. Nov. 6, 1945. 26696/46.

Dealkylation of alkyphenols.—Gulf Research & Development Co. Sept. 30, 1942. 23346/44.

Acetylene generators.—A. A. G. Magis. Oct. 23, 1941. 10085-86/47.

Generated proteins and process for preparation thereof.—Manufacturers Research Laboratories, Inc. Oct. 11, 1945. 29936/46.

Device for contacting liquids with gases.—N.V. de Bataafsche Petroleum Maatschappij. Nov. 9, 1945. 30720/46.

Detergent composition.—Procter & Gamble Co. Nov. 9, 1945. 19765/46.

Application of low temperature interesterification to glyceride mixtures containing mono and/or diglycerides.—Procter & Gamble Co. Nov. 6, 1945. 24055/46.

Manufacture of phenolic compounds.—Shell Development Co. July 22, 1944. 19543/45.

Derivatives of benzotetronic acid.—Spojene Farmaceuticke Zavody, Narodni Podnik. Nov. 6, 1945. 33023/46.

Method of casting resin.—Wingfoot Corporation. Nov. 8, 1945. 8748/46.

Preparation of aliphatic amino-polymethylene-carboxylic-acid-amides. — Algemeene Kunstzijde Unie N.V. Nov. 13, 1945. 21963/46.

Purification of sugar solutions.—American Cyanamid Co. Nov. 17, 1945. 28787/46.

Preparation of oil-soluble resins.—Bakelite Corporation. May 29, 1945. 16192/46.

Synthetic resins, etc., from olefinic compounds.—British Celanese, Ltd. Nov. 14, 1945. 33601/46.

Penicillin and other antibiotic products.—Carbonisation et Charbons Actifs. Nov. 14, 1945. 31479/46.

Process for colouring hydrophobic substances soluble in hydrocarbons.—Ciba, Ltd. Nov. 16, 1945. 31707-8/46.

Organo-silicon compounds.—Corning Glass Works. Nov. 15, 1945. 15382/46.

EDUCATIONAL

Great Possibilities for
QUALIFIED CHEMICAL ENGINEERS

VAST and far-reaching developments in the range of peacetime productions and markets of the Chemical Industry mean that the profession of Chemical Engineering will be of great importance in the future and one which will offer the ambitious man a career of outstanding interest and high status. The T.I.G.B. offers a first-class training to candidates for the Chemical Engineering profession.

Enrol with the T.I.G.B. for the A.M.I.Chem.E. Examinations in which home-study students of the T.I.G.B. have gained a record total of passes including—

FOUR " MACNAB " PASSES
and
THREE FIRST PLACES

Write to-day for the " Engineers' Guide to Success "—free—containing the world's widest choice of Engineering courses—over 200—the Department of Chemical Technology, including Chemical Engineering Processes, Plant Construction, Works Design and Operation, and Organisation and Management—and which alone gives the Regulations for A.M.I.Chem.E., A.M.I.Mech.E., A.M.I.E.E., C. & G., B.Sc., etc.

THE TECHNOLOGICAL INSTITUTE
OF GREAT BRITAIN
219, Temple Bar House, London, E.C.4

SITUATIONS VACANT

CHEMICAL Engineer for Works near London dealing in reconditioned Chemical Plant. Must be experienced in buying and selling machinery—handling enquries, etc. Reply stating qualifications and salary to Box No. 2472, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

CHEMIST (B.Sc. Honours or equivalent), with vision and initiative, wanted for London Central laboratory of group of firms manufacturing well-advertised household specialities (modern detergents, insecticides, etc.). Write stating experience, age, salary required. Confidential to Box No. 2475, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

EXPORT Sales Manager required by reputed firm manufacturing large quantities of modern detergents and other household specialities based upon scientific research. Will applicants knowing one to two foreign languages and having experience in the export trade (chemicals especially), state age, salary, previous experience. Write Box No. 2474, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

JUNIOR Chemist required for routine analysis, mainly raw materials, by Plastics Manufacturers, London area. Applicants should submit in confidence usual particulars, including salary expected. Box. No. 2480, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

PLANT Chemists urgently required for Process Plant Operation by large company operating in the Middle East. Applicants need not be Graduates but should have had a chemical training up to Inter. B.Sc. or National Certificate Standard with experience of shift work in either a gas, coke oven or chemical works. Age not over 30. Salary in sterling between £540 and £600 per annum, plus generous allowances in local currency, with free furnished bachelor accommodation, passages out and home, medical attention, also kit allowance and Provident Fund benefits. Apply, stating age, qualifications and experience, etc., to Dept. F.22, Box No. 2435, THE CHEMICAL AGE, 154, Fleet Street London, E.C.4.

PRODUCTION Manager required for a chemical works making toluene nitration products, barium compounds, iron compounds, and ground dressed barytes. Duties to maintain and increase output. Full particulars of experience and salary required to SECRETARY, Athole G. Allen (Stockton) Ltd., Stockton-on-Tees.

SITUATIONS VACANT

CHEMIST

Large organisation requires key chemical personnel to take charge of new project involving the manufacture of specialised plastic materials. Applicants must be graduate chemists with several years' experience in chemical manufacture. Age 25 to 35.

Mechanical and personnel-handling abilities essential.

Successful applicants will be given extensive training, including six months in America.

Apply by letter, giving full details of education, industrial experience and salary required, with a recent photograph, to—

Box 2482,
The Chemical Age,
154, Fleet Street, London, E.C.4.

LONDON Exporters have vacancy for energetic young man, able to work on own initiative, with previous experience in Dyes, Colours and Chemicals. Knowledge of typing preferable. Good prospects for right person. Write full particulars to Box No. 2481, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

THE British Drug Houses Ltd. require a Pharmacist and/or Chemist to act as Assistant to Stores Manager. Age 27-35. Please reply, stating qualifications and experience, to PERSONNEL MANAGER, Graham Street, London, N.1.

WORKS Engineer to maintain chemical plant. General practical experience required, preferably with knowledge of material handling plant. Full particulars and salary required to SECRETARY, Athole G. Allen (Stockton) Ltd., Stockton-on-Tees.

AUCTIONEERS, VALUERS, Etc.

EDWARD RUSHTON, SON AND KENYON (Established 1855).

Auctioneers' Valuers and Fire Loss Assessors of CHEMICAL WORKS, PLANT AND MACHINERY
York House, 12 York Street, Manchester.

Telephone 1937 (2 lines) Central, Manchester.

WORKING NOTICE

THE proprietor of British Patent No. 481100, entitled " Process for Separating Soluble and Valuable Constituents from Sylvinite Ores and Product or Products Obtained Thereby," offers same for licence or otherwise to ensure practical working in Great Britain. Inquiries to SINGER, EHLERT, STERN & CARLBERG, 28, East Jackson Blvd., Chicago 4, Illinois, U.S.A.

FOR SALE

One Triple effect Evaporating Plant by G. & J. Weir, each evaporator being 4 ft. 3 in. dia. by 6 ft. 9 in. high, cast iron construction : evaporating capacity 200 tons of seawater every 24 hours, fitted internally with 13 banks of copper steam coils, each bank secured into common header, large inspection door to facilitate easy replacement of coils, complete with brass tubular distiller condenser 3 ft. dia. by 4 ft. 10 in. between tube plates : all ancillary equipment including feed, circulating and fresh water pumps, all by above manufacturer; and a quantity oj spare steam coils.

Three complete Triple effect Evaporating Plants by G. & J. Weir with cast iron Evaporators 3 ft. dia. by 6 ft. 9 in. high, evaporating capacity 100 tons of seawater every 24 hours : fitted internally with 10 banks of copper steam coils, each secured into common header, large inspection door to facilitate easy replacement of coils : each unit is complete with distiller condenser 2 ft. dia. by 4 ft. 10 in. between tube plates : all ancillary equipment including combination feed, salt water and circulating pump, and fresh water pump : large quantity of unused spare coils available.

One Single effect salt water Evaporator by Weir, cast iron construction, 2 ft. 6 in. internal dia. by 5 ft. 6 in. high : capacity approx. 20/25 tons of seawater every 24 hours : fitted internally with multi-banks of copper steam coils secured into common cast iron headers : large inspection door to facilitate easy replacement of coils : complete with distiller condenser 4 in. dia. by 2 ft. 10 in. between tube plates : combination brine and fresh water pump and quantity of spare copper coils available.

One Electrically heated water Evaporator by Siemens, capacity approx. 10 tons of seawater per 24-hour day : manufactured in 1943 : electric supply being 220 volts, complete with rotary pump driven by 18-h.p. (13.5 kw) D.C. motor by Siemens Schukert, 220 volts, running at 1800 r.p.m. enclosed ventilated machine, ball bearing.

Portable Crushing and Screening Plant by R. H. Marsden Ltd., serial No. D.4, comprising 16 in. by 9 in. Crusher mounted on trailer-drawn chassis with 24 in. by 8 in. front wheels and 30 in. by 8 in. rear wheels. Contents of Crusher discharge into underslung Rotary Screen approx. 8 ft. long by 2 ft. 6 in. dia. with four standard screen sections. Unit driven by horizontal Blackstone Diesel Engine rated at 20 b.h.p. at 550 r.p.m., type OPH. Included with this unit are one set of screens and four jaws, starting handles, spanners, etc., in three cases.

GEORGE COHEN SONS & CO. LTD.
SUNBEAM ROAD, N.W.10
and STANNINGLEY, Nr. LEEDS

AIR Receivers, 40, dished ends, 4 ft. 6 in. by 22 in. dia. tested 120 lbs. hydraulic, £5 each inspected Hatcham Road, S.E.15. THOMPSON & SON (Millwall) Ltd., Cuba Street, Millwall, London, E.14.

CHARCOAL, ANIMAL, and VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams, "Hill-Jones, Bochurch, London." Telephone 3285 East.

FOR sale—Large quantity of used activated carbon. Box No. 2478, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

METAL Powders and Oxides. Dohm Limited, 167, Victoria Street, London, S.W.1.

REGULAR supplies of iron powder of various grades. Box No. M98 c/o JACKSONS, 16, Gracechurch Street, London, E.C.3.

FOR SALE

COUNTY BOROUGH OF SOUTHPORT.
GAS DEPARTMENT.

OFFERS are invited for our "Make" of Crude Concentrated Ammonia, estimated at approximately 400 tons of a strength about 16 per cent. NH_3 by weight, over a period of twelve months commencing on or about 1st October, 1947.

Best offers, per unit per ton, loaded into Buyer's Tank wagons F.O.R. Blowick Sidings, Southport L.M. & S. Railway, to be forwarded to the undersigned in plain sealed envelope endorsed "Concentrated Ammonia" not later than 26th June, 1947.

R. EDGAR PERRINS,
Town Clerk.

Town Hall,
Southport.
5th June, 1947.

MORTON, SON & WARD LTD.
OFFER
MISCELLANEOUS ITEMS FROM STOCK

TWO—220-gallon Open Top Aluminium Rectangular Tanks, 6 ft. by 2 ft. by 2 ft. 6 in. by $\frac{1}{16}$ in.
TWO—Ditto. 5 ft. by 2 ft. by 2 ft. 6 in.
ONE—150-gallon copper steam jacketed Boiling Pan, 3 ft. dia. by 3 ft. 6 in. deep, dish bottom.
TWO—2500-gallon dish-ended welded Pressure Receivers, 13 ft. 6 in. long by 6 ft. dia., 100 lb. per sq. in. w.p.
ONE—1200-gallon Rivetted ditto, 6 ft. 6 in. by 6 ft. 3 in. dia., 100 lb. per sq. in w.p.
SEVERAL—New and unused 3000-gallon per hour GWYNNE Centrifugal Pumping Sets, 60-ft. head, 3-h.p. 400/3/50 cycles supply, direct coupled motors.
EIGHT—Ditto by Worthington-Simpson, all gunmetal.
THREE—300-g.p.h. De Laval Industrial Centrifugal Separators, inbuilt pumps and motors, 400/3/50 cycles. (As new.)

MORTON, SON & WARD LTD.
WALK MILL, DOBCROSS, Nr. OLDHAM
'Phone - Saddleworth 437

NEW Stainless Steel Vertical Cylindrical Tanks, 25, 50 and 100 gallon capacity, either with handles, or mounted in rubber castored cradle.
Also Stainless Steel Water-jacketed Pans with similar capacity, arranged for heating by water, oil, gas, electricity or steam.
Also Mild Steel Jacketed Pans for 50 lb. and 80 lb. working pressure, 20/300 gallons capacity.
DELIVERY from stock.
Wanted to purchase second-hand chemical plant—best prices given.

THE MANICRAFT ENGINEERING COMPANY LIMITED
Pryme Street Mills, off Chester Road, Hulme,
Manchester, 15.

50,000 Ft. Tubular Scaffolding and Fittings.
100 Extension Ladders.
50 Pole Ladders.
50 pairs Builders' Trestles.
50 pairs Decorators' Steps.
1000 gallons Hard Gloss Paint, all shades.
50 tons Washable and Oilbound Distempers.
30,000 ft. Solid Drawn Tubes, 1 in. O/D., $\frac{3}{4}$ in. I/D.
100 tons Angle Iron, 4-ft. and 6-ft. lengths.
50 tons Angle Iron, long lengths.
100 tons Rods, R.S.J.'s, Strips and Corrugated Sheets.
20 Builders' Handcarts.
5000 sheets Asbestos, Corrugated and Flat.
We also have—
Canteen Tables and Forms.
Tarpaulins.
Dust Sheets and
Protective Clothing of all description.
Write for our Price List.

NORDA (GREAT BRITAIN)
162–166, Broadway
SOUTHALL, MIDDLESEX
Phone : SOUTHALL 3755
Telegrams : "NORDA," SOUTHALL

FOR SALE

2 Vertical Stearine Presses
1 Hydraulic Baling Press
1 Shirtliffe Baling Press
48 in. Belt-driven Hydro
42 in. Under-driven Hydro
Jacketed Mixing Pan, 7 ft. dia., 9 ft. deep
7 various Filter Presses
Ball-bearing Gravity Conveyor, 6 in. pitch, 14 in. wide, 8 ft. lengths
12 Vertical Weir & Hall Steam Pumps
Several small Steam-jacketed Copper Pans
Plant and Frame Filter Press, 19 in. square
Three C.I. Sectional Tanks
Several Ball Mills, 6 ft. 6 in. by 6 ft. 8 in., Silex-lined batch type, with driving gear and clutch
Premier Filter Press by Mather & Platt, 32 in. sq., fitted 26 ribbed plates and 27 frames, bottom corner feed, tap outlets, angle lever closing gear.
3½ size Harrison Carter Disintegrator
2½ size Harrison Carter Disintegrator
Iwel-Laab size 0 Melter, motorised
Porteous size 3 Grinder with Motor
Two set 2-pair high Breaking Rolls, 33 in. long.
One 18-in. 4-roll Cake Cracking Mill
One 36-in. dia. Swan Neck Hydro Extractor
Five Large Filter Presses
One Oram Barrel Hooping Press

Write: RICHARD SIZER LIMITED, ENGINEERS, CUBER WORKS, HULL

Phone: 98 Staines.

600-GALLON Steel Still Column and Condenser, Steel Tubular Condenser, 18 ft. long 150—1 in. tubes. 2 Earthenware—Stainless Mixers, 200 galls. Several Earthenware Rectangular Containers. Jacketed Steel Pan, 5 ft. 6 in. by 2 ft. 8 in.

HARRY H. GARDAM & CO. LTD. STAINES.

1000 STRONG NEW WATERPROOF APRONS, To-day's value 5s. each, Clearing at 30s. dozen. Also large quantity Filter Cloths, cheap. Wilsons, Springfield Mills Preston, Lancs. Phone 2198.

SERVICING

GRINDING, Drying, Screening and Grading of materials undertaken for the trade. Also Suppliers of Ground Silica and Fillers, etc. JAMES KENT, LTD., Millers, Fenton, Staffordshire. Telegrams: Kenmil, Stoke-on-Trent. Telephone: 4253 and 4254, Stoke-on-Trent (2 lines).

GRINDING of every description of chemical and other materials for the trade with improved mills.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams: "Hill-Jones, Bochurch, London." Telephone 3285 East.

LONDON FIRM offers complete service packing powders of all descriptions, also liquids and chemicals. Long runs only. Containers and packing cases for home and export, made on premises. Near to docks. Own rail sidings. Box No. 2331, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

PULVERISING and grading of raw materials DOHM LTD., 167, Victoria Street, London, S.W.1.

TRANSLATIONS Russian-English, English-Russian, German-English, English-German. Expert knowledge of scientific and technical terms. Box No. 2479, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

WE have grinding facilities for all types of materials. Write OILCAKES and OILSEEDS TRADING CO. LTD., 108A Cannon Street, E.C.4. 'Phone: Man. 2656.

SURPLUS
RE-CONDITIONED
CHEMICAL PLANT & MACHINERY

for

IMMEDIATE DELIVERY

State your requirements

to

HODSON & CO. (MACHINERY) LTD

TOTTINGTON · BURY · LANCS

PHONE: TOTTINGTON 123

WANTED

**COUNTY BOROUGH OF SOUTHPORT.
GAS DEPARTMENT.**

TENDERS are invited for approximately 15 tons of Active Carbon for use in Benzole Recovery Plant, to be delivered as required over a period of twelve months to the Gas Works, Blowick, Southport.

Tenders, containing a full specification of the Active Carbon offered, together with best offer for Spent Carbon returned for re-activation, to be forwarded to the undersigned in plain sealed envelope endorsed "Carbon" not later than 26th June, 1947.

R. EDGAR PERRINS,
Town Clerk.

Town Hall,
Southport.
5th June, 1947.

BICHROMATE-POTASSIUM or Sodium urgently required. State price and quantity (1-Cwt. minimum). GEORGE RICE LTD., Hudson Bay Works, Warton Road, Stratford, London, E.15. Telephone Maryland 1222.

WANTED.—Supplies of Nitre Cake in ten-ton lots. Box No. 2126, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

Printed in Great Britain by THE PRESS AT COOMBELANDS, Ltd., Addlestone, and published by BENN BROTHERS LTD., at Bouverie House, 154, Fleet Street, E.C.4, 14 June 1947. Registered at the General Post Office. Entered as Second Class Matter at the New York, U.S.A., Post Office.